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The Cottony Leak of *Citrullus fistulosus* Fruits

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INTRODUCTION

The association of *Pythium aphanidermatum* (Eds.) Fitz. with the fruit-rot of a number of cucurbits is now well known. In India, as early as 1923, McRae (1923) isolated strains of *Pythium* from various rotting cucurbitaceous fruits, viz., *Luffa acutangula* Roxb., *L. aegyptiaca* Mill., *Trichosanthes anguinea* L., and *Lagenaria vulgaris* Ser. In the United States Drechsler reported in 1925 considerable losses of cucumbers (*Cucumis sativus*) during transit due to decay caused by *Pythium aphanidermatum* for which he suggested the name cottony leak. A year later the same author (Drechsler, 1926) reported the cottony leak of egg-plant (*Solanum melongena*) fruits. In 1928 Mitra and Subramaniam reported *Pythium aphanidermatum* as the cause of considerable damage to cucurbitaceous fruits, viz., *Luffa acutangula*, *L. aegyptiaca*, *Trichosanthes anguinea*, *T. dioica*, *Cucumis sativus*, *Lagenaria vulgaris*, *Momordica charantia* and *Cucumis melo* var. *momordica*, which are used in India as vegetables.

MATERIAL EXAMINED

In India, the fruits of *Citrullus fistulosus* Stocks¹ (English name none, vernacular names: tinda, tendu, dilpasand, etc.) are highly thought of as a vegetable. The fruits are about the size of a small turnip, of a light green color, depressed at each end, hispid when young, at length becoming quite smooth. They are often picked when only two-thirds grown. In the northwestern part of India the cultivation of this vegetable is confined to the western districts from where it is exported to other neighboring areas. According to Royle (cited by Duthie and Fuller, 1883), its seeds are used medicinally. This paper deals with a disease of these "tinda" fruits (this popular name is here adopted for the sake of brevity) which the writer first observed in specimens collected by him at the Allahabad market in May, 1952. They were subsequently collected at the market during the rainy season of the same year.

¹ = *Citrullus vulgaris* Schrad. var. *fistulosus*, vide Duthie and Fuller, 1883.

The external and internal symptoms of the disease were mostly similar to those described by Drechsler (1925) for cucumbers. Each infected fruit was encased in an outgrowth of a cottony mycelial web

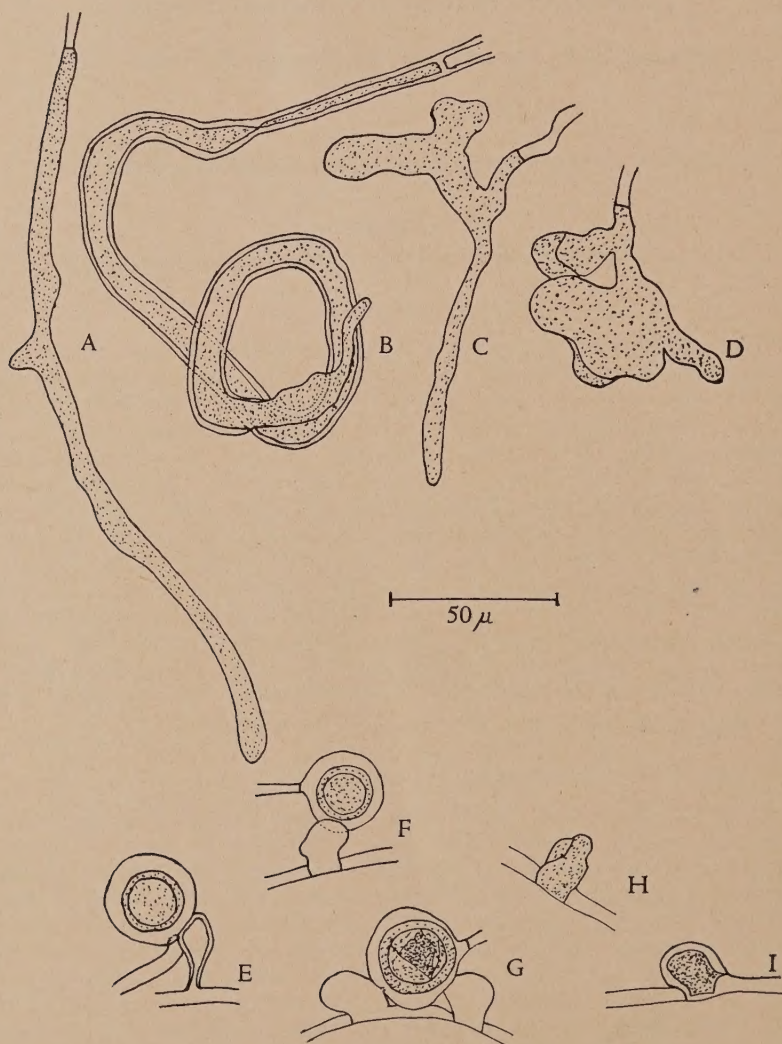


FIG. 1. *Pythium aphanidermatum* (Eds.) Fitz. A-D: Different forms of sporangia (B: an unusual sporangium developed on Potato-dextrose agar). E-F: sex-organs. G: Oogonium with two antheridia. H-I: Antheridia alone.

matted down, at places, into a wet membranous layer. The tissue of the fruit was very watery and lacked mechanical firmness, while the decaying matter emitted a peculiar odor.

Diseased "tinda" fruits are not found very frequently in the local market. It is possible that in other areas of the province the disease may be more frequent but unnoticed. The disease is apparently characteristic of transit and storage.

Microscopic examination of the affected fruits revealed the fresh cottony outgrowth as a mass of mycelium composed of nonseptate hyphae. Where the cottony outgrowth had matted down, closely adhering to the substratum, innumerable oogonia with antheridia and oospores were found in all stages of development. Inside the fruit the softened tissue contained branching mycelium and a few sex organs.

The fungus was isolated by transferring a portion of the aerial mycelium from a decaying fruit to an oat meal agar plate and then transferring portions of the mycelium from the resulting growth to sterile tubes of the same medium. Within a day the tubes were filled with a wooly growth of the fungus.

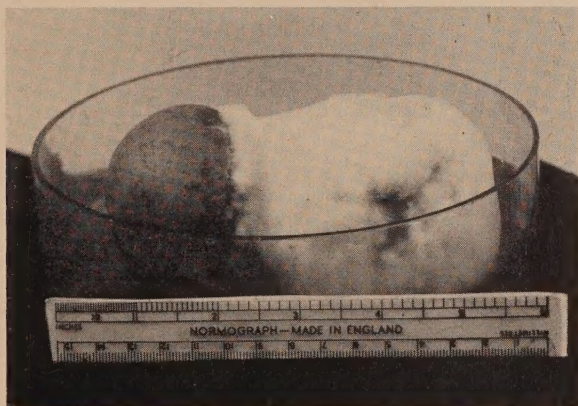


FIG. 2. Copious extramatrical mycelium, developed within 48 hours on an inoculated "tinda" fruit (Right), growing over an adjacent healthy fruit (Left), at present only partially invested.

MORPHOLOGY OF THE FUNGUS

Hyphae measuring 2.8 to 7.3 μ are hyaline and nonseptate except in fructification. Sporangia were readily produced on putting pieces of infected fruit or transferring thin slices from the surface of oat-meal agar cultures of the fungus into a shallow layer of sterile water. Within a few hours sporangia, varying from slightly thickened but otherwise undifferentiated hyphal segments of considerable length to irregular, swollen, digitate or lobulate elements were produced (Fig. 1, A-D). In length sporangia varied from 50 μ to more than 1000 μ and 4 to 20 μ wide. Oogonia spherical, terminal, rarely intercalary, 22 to 27 μ in diameter. Antheridia monoclinal and also diclinal, typically intercalary, mostly one but rarely two per oogonium (Fig. 1, G), barrel or dome-shaped, broadly adnate to the oogonium, measuring 10 to 17.4 μ by 10 to 12 μ (Fig. 1, E-G). Antheridia alone

(not attached to the oogonium) are rarely encountered (Fig. 1, H-I). Oospores aplerotic, single, with a moderately thick wall, measuring 13 to 24 μ in diameter.

On the basis of these characteristics the fungus was readily identified as *Pythium aphanidermatum* (Eds.) Fitz., with which the following fungi are now considered to be synonymous:

- Nematosporangium aphanidermatum* (Eds.) Fitz. Mycologia **15**: 166-173. 1923.
N. aphanidermatum (Eds.) Sideris, Mycologia **23**: 252-295. 1931.
N. aphanidermatum var. *hawaiiensis* Sideris, l. c.
Pythium bulleri Subramaniam, Mem. Dept. Agr. India, Bot. **10**: 181-194. 1919.
Rhenosporangium aphanidermatum Edson, Jour. Agr. Res. **4**: 279-292. 1915;
Mycologia **15**: 166-173. 1923.

PATHOGENICITY

The pathogenicity of the fungus was repeatedly demonstrated by inoculation into healthy "tinda" fruits. The fruits selected for inoculation were surface sterilized by dipping in potassium permanganate solution (2/1000) for 20 minutes then washed in three changes of sterilized distilled water and the surface wiped with absolute alcohol. Ten such fruits with deep aseptic incisions (with the help of a sterilized cork borer) and ten with slight scraping (with a sterilized scalpel) slightly below the epidermis were inoculated with pieces of mycelium from a pure culture of the fungus. The fruits were placed in a glass chamber without additional water. The growth of the fungus on the fruits and their subsequent decay was unusually rapid. Within twenty-four hours aerial mycelium was present in large quantity in the deeply incised fruits while in scraped ones it occupied an area about 2 cm. in diameter. In another twenty-four hours, in both the types of fruits, i.e., with deep aseptic incisions and slight scraping, almost the entire surface of most of the fruits was covered with a wooly outgrowth of the mycelium of the fungus. The control fruits, kept with but away from the inoculated ones, remained unaffected. Further, some of the diseased fruits were also kept in contact with the apparently healthy fruits. The result was that soon the healthy fruits also got infected (Fig. 2). From this experiment it became evident that the aerial mycelium of the individual fruit bearing an original infection grows out between adjacent fruits partially or often completely investing them. There is no doubt that this investment results in the quick infection of "tinda" fruits if their epidermis is injured and rather slow infection but to the same extent even if the epidermis, as far as can be ascertained, is free from wounds.

In each case the fungus was isolated from the rotting fruits and resembled the parent culture in all respects.

CONTROL MEASURES

Unfortunately no information is available concerning the incidence of the original infection of "tinda" fruits. It is most probable that infection takes place during transit and in storage. The only economical and practicable remedy that can be suggested at present is the proper handling of these fruits during transit and sorting out diseased fruits when in store.

SUMMARY

Fruits of *Citrullus fistulosus* Stocks (English name none, popularly known in India as "tinda") are highly thought of as a vegetable in India but are, for the first time reported, subject to occasional infection by *Pythium aphanidermatum* (Eds.) Fitz. Infection occurs, probably, during transit and in storage, and is carried from diseased fruits to adjacent healthy ones by copious production of extramatrical mycelium.

Proper handling of the fruits during transit and sorting out diseased fruits during storage have been suggested.

ACKNOWLEDGMENT

The author thanks the Scientific Research Committee, U.P., for the contingent grant, a part of which was utilized in this study.

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New Species and Varieties in *Cephalotaxus*

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Cephalotaxus is a genus of eastern Asiatic conifers, found especially in temperate regions. The taxonomic status of some of the seven known species is much disputed. The species of *Cephalotaxus*, like those of the related genera *Taxus* and *Amentotaxus*, are differentiated chiefly on the characters of the leaves. In some, such as *C. fortunei* Hook. and *C. oliveri* Masters, the vegetative characters are very distinct and these species are readily separable from the others. Other species of closer relationships are distinguishable on certain more or less constant but usually not pronounced characters. These species are often differentiated as such because of their distinct and exclusive ranges, but further investigations may prove them to be geographical varieties of a few polymorphic species.

All species of *Cephalotaxus* are trees or sometimes shrubs of mountain forests. Most of the species occupy limited ranges. Only *C. fortunei* Hook. and *C. sinensis* (Rehder & Wilson) Li, *infra*, of the temperate regions of China, are more or less wide-spread. *Cephalotaxus sinensis* was formerly considered as a variety of *C. drupacea* Sieb. & Zucc. a Japanese species, but also recorded from China (Rehder & Wilson in Sargent, Pl. Wils. 2: 3. 1914). As noted below, the latter record is subject to revision, as the two species occupy exclusive ranges in China and Japan respectively, and possess certain distinct morphological characters. A new species from Hainan Island is described below, having the southernmost range of all known species of the genus. In addition a fairly distinct variety of the widely distributed *C. fortunei* is described from the alpine regions of southwestern China.

All species herein cited are deposited in the United States National Herbarium, Smithsonian Institution. I am indebted to the authorities of the Institution for the privilege of consulting their collections.

Cephalotaxus sinensis (Rehder & Wilson) comb. nov.

Cephalotaxus drupacea var. *sinensis* Rehder & Wilson in Sargent, Pl. Wils. 2: 3. 1914; Pilger in Mitt. Deutsch. Dendr. Ges. 1916 (25): 22. 1917.

Cephalotaxus harringtonia var. *sinensis* (Rehder & Wilson) Rehder in Journ. Arnold Arb. 22: 571. 1941; Florin in Acta Hort. Berg. 14: 370, 1948 (see for full synonymy).

A shrub, about 2-4 m. high, branching; bud scales chartaceous, oblong to ovate-triangular, acuminate, about 3 mm. long and 1.5 mm. wide, keeled. Leaves distichous, thinly coriaceous, subsessile, straight or sometimes subfalcate, linear-lanceolate, 2.5-4 cm. long, 2-3.5 mm. broad, sometimes to 5 mm., gradually tapering to a sharp acute to acuminate point, the base contracted, rounded to subacute, obscurely green above, with 2 glaucous to glaucescent stomatal bands beneath, the midrib raised and conspicuous on both surfaces. Staminate heads globose, 6-10 mm. across; pedicels 2-4 mm. long, with a few scales;

bracts 8-10, ovate, small, more or less rounded at tip, about 2.5 mm. across; anthers with scarcely appendaged connectives. Pistillate cone on peduncles to 1 cm. long. Seeds obvoid-oblong, about 2.8 cm. long and 1.7 cm. broad, more or less rounded and mucronate at apex, narrowed at base.

China, widely distributed from southern Shensi, Szechuan, western Hupeh, and Honan, to Chekiang, Kiangsu and Anhwei in the east and Kwangtung in the south; in thickets and woodlands.

China: Szechuan: Mupin, *E. A. Wilson* 1115 (type collection). Hupeh: Western Hupeh, *A. Henry* 7831; Hsing-shan District, *E. H. Wilson* 167, 167a, 267; Mt. Nang-tiang, *P. C. Sylvestri* 3986. Chekiang: No precise locality, *S. P. Barchet* 629 p. p.; Tien-tai Shan, *C. Y. Chiao* 14314, *R. C. Ching* 1546; Hangchow, *W. C. Cheng* 100. Anhwei: Huang Shan, *A. N. Steward* 7206.

In the past this species was confused with *C. fortunei*, *C. griffithii* and *C. pedunculata*. Rehder and Wilson described it very briefly as a variety of the Japanese *C. drupacea*. The differences between this and *C. drupacea* are summarized clearly by Rehder and Wilson as follows: "The very narrow lanceolate leaves tapering to a sharp, acuminate point distinguish this variety from the type in which the leaves are linear and abruptly contracted to a mucronate apex." However, they considered the typical form of *C. drupacea* as also occurring in China, citing two collections, *Henry* 5030 and 7831 from western Hupeh, with the statement that "Henry's specimens are male and apparently typical and are the only ones we have seen from central China referable to the type species." A specimen of *Henry* 7831 available to me shows that the leaves, while less conspicuously attenuate-acuminate toward the apex than in most other specimens from China, have a clearly tapering point and are not of the same width throughout the length and abruptly mucronate as in the Japanese specimens of *C. drupacea*. It seems that *C. drupacea* is confined to Japan while all Chinese specimens, which are distinct from Japanese ones, belong to a separate species, *C. sinensis*.

***Cephalotaxus sinensis* f. *globosa* (Rehder & Wilson)**
comb. nov.

Cephalotaxus drupacea var. *sinensis* f. *globosa* Rehder & Wilson in Sargent, Pl. Wils. 2: 4. 1914.

Bush about 3 m. tall; seed globose or subglobose.

China: Hupeh: Hsing-shan District, *E. H. Wilson* 163.

Rehder and Wilson are of the opinion that this form may prove to be identical with *C. pedunculata* var. *sphaeralis* Masters = *C. harringtonia* f. *sphaeralis* (Masters) Rehder, described from specimens in cultivation. Rehder and Wilson say that "it is exceedingly doubtful if the shape or size of the fruit in *Cephalotaxus* is of any taxonomic value." They have separated this form in the hope that the origin of Master's plant can be elucidated. As no additional material has become available, no further comment can be made other than placing Rehder and Wilson's form on record as being based on a plant growing spontaneously in the wild.

Cephalotaxus hainanensis sp. nov.

Cephalotaxus drupacea var. *sinensis* sensu Groff, Ding & Groff in Lingnaam Agr. Rev. **1**:41. 1923; Merr. in Lingnan Sci. Jour. **5**:22. 1927; Groff in Lingnan Sci. Jour. **9**: 279. 1930; Odashima & Tanaka in Journ. Soc. Trop. Agr. **12**: 196. 1940; Masamune, Fl. Kainan. **38**. 1943; non Rehder & Wilson.

Cephalotaxus drupacea sensu Tanaka & Odashima in Journ. Soc. Trop. Agr. **10**: 363. 1938; non Sieb. & Zucc.

Arbor 10–20 m. alta, trunco 40 cm. ultra in diametro; ramulis oppositis vel non-oppositis, tenuibus, plus minusve horizontaliter patentibus; squamis gemmiferis minutis, chartaceis, triangulari-ovatis, acuminatis, circiter 1.5 mm. longis 1 mm. latis, vix carinatis; foliis distichis, tenue chartaceis, subsessilibus, distincte linearibus, seape rectis, interdum leviter falcatis, circiter 2.5–3.5 cm. longis, 2.5–4 mm. latis, apice in mucronis abrupte constrictis, basi subtruncatis et plus minusve rotundatis, margine planis, in sicco erevolutis, supra obscure viridibus, subtus fasciebus 2 stomatiferis glaucescentibus praeditis, costa supra subconspicua, plerumque ad parte inferiore elevata, subtus plana virida; strobilis ignotis.

Hainan: Fan Yah, alt. 3500 ft. in forested ravine, *N. K. Chun* & *C. L. Tso* 44183, 1932–33 (type); Hainan, in mixed woods, *C. Wang* 35818, Dec. 22, 1933.

The two available specimens are sterile. This Hainan plant is very different from *C. sinensis* of the mainland in being a tall tree instead of a shrub and in the relatively shorter and broader leaves which are of the same width throughout the length and abruptly mucronate at the apex, instead of gradually tapering toward the tip as in *C. sinensis*. Its leaf-shape is similar to that of the more distant Japanese *C. drupacea* Sieb. & Zucc., from which the new species differs readily in the relatively shorter, broader, and much thinner leaves with less conspicuous midribs. The leaves are not revolute when dry as in the Japanese species.

Cephalotaxus fortunei Hook. var. *alpina* var. nov.

Frutex 2–13 m. alta; foliis a typo speciei differt parvibus et angustibus, 4–7 cm. raro ad 8 cm. longis, 3–3.5 mm. latis; strobilis masculinis subsessilibus vel brevissime pedicellatis, pedicellis haud 2 mm. longis, maturis valde crassis, ad 4–6 mm. longis.

At altitudes of 1000–3300 meters, in northwestern Yunnan and Sikang.

Yunnan: Between Tengyueh and Likang, *J. F. Rock* 8150; Likang, *J. F. Rock* 8298; Litiping Range, east of Weihsi, *J. F. Rock* 8691, 9397, 11572 (type), 11575; near Laitoupu, *J. F. Rock* 12002; Luten, below Likang, *J. F. Rock* 18478; Peyentsin, *S. Ten* 315.

Sikang: Between Ralapa and Sinku, *C. Schneider* 7290.

This is a low growing variety with smaller leaves, found at high altitudes in northwestern Yunnan and adjacent parts of Sikang. It may eventually prove to be distinct enough from *C. fortunei* Hook. to be recognized as a separate species.

The Genus *Scrophularia* in China

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Scrophularia is a genus of over 150 species found in the northern hemisphere mostly in the colder regions of Europe, Asia, and North America. In China most species of this genus occur in the alpine regions in the west where many species of very limited ranges apparently occurred in the past.

The corolla of *Scrophularia* differs little from species to species. Specific differences are mostly based on characters of the leaves, pubescence, and inflorescences. Therefore related species are often difficult to separate. Lack of access to authentic specimens of some of the species described from western China made this study difficult, and thus the following arrangement, formulated on available material and literature, is necessarily tentative. Five new species are proposed.

The material was based on specimens borrowed from the following herbaria: Arnold Arboretum (AA), Academy of Natural Sciences of Philadelphia (ANSP), Gray Herbarium (GH), Missouri Botanical Garden (MBG), National Taiwan University, Formosa (NTU), New York Botanical Garden (NYBG), Royal Botanic Gardens, Edinburgh (RBGE), University of California at Los Angeles (UCLA), University of Pennsylvania (UP), and the United States National Herbarium (USNH). I am indebted to the curators of these herbaria for their generosity in furnishing material for this study. To the late Dr. F. W. Pennell, I am grateful for his advice and suggestions. Acknowledgement is due also to the American Philosophical Society for a grant supporting studies of the Scrophulariaceae in the field and in herbaria in China, and to the University of Pennsylvania for a postdoctoral Harrison Research Fellowship, during the tenure of which, this study was initiated and partly conducted.

SCROPHULARIA [Bauhin] Linnaeus

Scrophularia L., Sp. Pl. 619. 1753, Gen. Pl. ed. V. 271. 1754. Type species: *S. nodosa* L. of Europe; see Pennell in Proc. Acad. Sci. Phila. 82: 21. 1930.

KEY TO THE SPECIES OF CHINA

- A. Veins of leaf-blades freely anastomosing, the venation thus finely reticulate; stems solitary or few, usually tall; annuals or perennials. (Section *Anastomosantes* Stiefelhagen.)
 - B. Pedicels usually bracteolate near the middle or above; leaves broad, about as long as wide to not over $1\frac{1}{2}$ as long as wide.
 - C. Corolla yellow or greenish; calyx lobes with entire margins.
 - D. Leaf-bases truncate to usually more or less acute.....1. *S. fargesii*
 - DD. Leaf-bases rounded to cordate.
 - E. Corolla 10 mm. long; calyx-lobes oblong, subcordate.....2. *S. kansuensis*
 - EE. Corolla about 6-8 mm. long; calyx-lobes rounded.....3. *S. urticaefolia*
 - CC. Corolla red; calyx lobes membranaceous and slightly crenulate along the margins.....4. *S. wilsonii*
 - BB. Pedicels with bracteoles at base only, not in the middle or above; leaves narrower, usually twice as long as wide.

- C. Stamens long exserted, calyx-lobes acute.....5. *S. petilmenginii*
- CC. Stamens included, rarely slightly exserted; calyx-lobes acute to rounded.
- D. Inflorescence short or long racemose to subspicate; cymes sessile or subsessile, usually few (3-6)-flowered, the flowers more or less densely arranged, in whorls or not, short pedicelled.
- E. Calyx-lobes short, rounded at apex.
 - F. Flowers not in whorls; corolla about 8-9 mm. long; leaves with small sharp serrations.....6. *S. buergeriana*
 - FF. Flowers in whorls; corolla 1.2-1.5 cm. long; leaves with large, acute to obtuse serrations.....7. *S. alaschanica*
- EE. Calyx-lobes ovate to oblong, the apex acute to acuminate, sometimes obtuse, never rounded.
 - F. Inflorescence elongated, the flowers in many fascicles, the lower distant.
 - G. Sterile filaments linear, small.....8. *S. mandshurica*
 - GG. Sterile filaments obovate, distinct, the apex truncate-crenulate.....9. *S. spicata*
- FF. Inflorescence short, the flowers in 1-3 fascicles, usually densely arranged, sometimes subcapitate.
 - G. Upper leaves long-petiolate; inflorescence in a single terminal cyme only.....10. *S. henryi*
 - GG. Upper leaves short-petiolate; inflorescences usually in more than one cyme.
- H. Upper corolla-lobes only slightly longer than the lower; leaves very deeply dentate (to 5 mm.).
 - I. Flowers with shorter pedicels and densely arranged, the pedicels as long as the calyx; petioles to 10 mm. long.....11. *S. moellendorffi*
 - II. Flowers with longer pedicels and more laxly arranged, the pedicels $1\frac{1}{2}$ -2 times as long as the calyx; petioles 15-35 mm. long, winged.
 - J. Stems flexuose; leaves larger, to 4.5 cm. wide and 6 cm. long, with longer (3.5 cm.) petioles and deeper serrations; corolla larger, about 1.3 cm. long and 1 cm. wide.....12. *S. campanulata*
 - JJ. Stems erect; leaves smaller, to 3.5 cm. wide and 5 cm. long, with shorter (1.5 cm.) petioles and less deeper serrations; corolla smaller, about 1 cm. long and 7 mm. wide.....13. *S. multiensis*
- H. Upper corolla-lobes almost twice as long as the lower; leaves shallowly dentate.
 - I. Calyx glandular; leaves and inflorescences pubescent.
 - J. Plant 15-60 cm. tall; leaves ovate, 25-35 mm. long, 10-20 mm. wide; calyx 7-9 mm. long, the lobes lanceolate; corolla narrower, about 15 mm. long and 5 mm. wide, more or less densely pubescent outside.....14. *S. chasmophila*
 - JJ. Plant hardly 10 cm. tall; leaves cordate to broadly ovate, 7-13 cm. long and 6-13 cm. wide; calyx 4-5 mm. long, the lobes oblong-ovate; corolla broader, about 15 mm. long and 6-7 mm. wide, sparsely pubescent outside.....15. *S. nana*
 - II. Calyx glabrous; leaves and inflorescences also glabrous.
 - J. Corolla larger and broader, 12-15 mm. long, 6-7 mm. wide; leaves larger, 2 cm. or more in length.....16. *S. delavayi*
 - JJ. Corolla smaller and narrower, 10-12 mm. long, 4 mm. wide; leaves usually less than 2 cm. long.
 - K. Inflorescence subcapitate; corolla-tube globose, the upper lip about 5 mm. long.....17. *S. hypsophila*
 - KK. Inflorescence short but with the flowers more or less distally arranged; corolla-tube cylindric, the upper lip about 3 mm. long.....18. *S. rockii*

- DD. Inflorescence more or less paniculate, the flowers laxly arranged, with long slender pedicels.
- E. Calyx-lobes short, rounded.
- F. Plants low, 10-20 cm. tall; calyx glandular; inflorescences relatively small and with few flowers.
- G. Plant densely lanose especially below, taller; rhizome elongate; corolla greenish.....19. *S. yunnanensis*
- GG. Plant glandular pilose, lower; rhizome bulbous; corolla dark,20. *S. souliei*
- FF. Plants tall, 30 cm. or more high; calyx glabrous; inflorescences large and many flowered.
- G. Leaves incised-serrate; stamens slightly exserted.....21. *S. amgunensis*
- GG. Leaves not incised-serrate; stamens included.
- H. Petioles short, scarcely to 1 cm. long; leaves very finely denticulate, the dentations sharp.....22. *S. microdonta*
- HH. Petioles long, 1-2 cm. or more in length; leaves dentate to crenate-dentate.
- I. Leaf-base acute, long attenuate.....23. *S. formosana*
- II. Leaf-base rounded to truncate or subcordate, not attenuate.
- J. Leaves duplicate-serrate.....24. *S. yoshimurae*
- JJ. Leaves simple-serrate.
- K. Petioles not winged; rhizome bulbous.
- L. Petioles to about 1-1.5 cm. long; leaf-bases more or less rounded to truncate or subcordate; pedicels longer (1 cm. or more) and more slender.....25. *S. ningpoensis*
- LL. Petioles to about 1.5-2 cm. long; leaf-bases distinctly cordate; pedicels shorter (to 1 cm. or less) and stouter.....26. *S. nodosa*
- KK. Petioles more or less winged; rhizome not bulbous,27. *S. grayana*
- EE. Calyx-lobes ovate to oblong, acute to acuminate, rarely obtuse, never rounded.
- F. Petioles broadly winged; calyx-lobes distinctly crenulate.....28. *S. crenatosepala*
- FF. Petioles not winged or only slightly so; calyx-lobes entire.
- G. Leaves narrow, lanceolate, 7-8 cm. long, the margins usually doubly serrate; calyx glabrous; staminode obovate, short.....29. *S. diplodonta*
- GG. Leaves ovate to ovate-lanceolate, 5-6 cm. or less long, the margins irregularly dentate; calyx glabrous or glandular-hairy; staminode reniform.
- H. Calyx glabrous, the lobes ovate to ovate-lanceolate, leaf-bases rounded to acuminate.
- I. Calyx-lobes ovate-lanceolate, the apex acute to acuminate, recurved.....30. *S. mandarinorum*
- II. Calyx-lobes ovate, the apex obtuse, not recurved.....31. *S. duclouxii*
- HH. Calyx glandular-hairy, the lobes broadly ovate; leaf bases truncate to subcordate.....32. *S. stiefelhagenii*
- AA. Veins of leaf-blades not or only slightly anastomosing; stems several or many, usually lower and more branched; perennials, usually woody. (Section Tomiophyllum Benth.)
- B. Plants low, about 8-10 cm. tall; flowers large, 1.7 cm. long, the corolla about 3 times as long as the calyx, yellow.....33. *S. przewalskii*
- BB. Plants tall, 20-30 cm. or more high; flowers small to medium-sized, less than 1 cm. long, the corolla 2-3 times as long as the calyx, purple.
- C. Plants more or less glandular-hairy throughout; leaves linear to lanceolate, serrate.....34. *S. cretacea*
- CC. Plants glabrous; leaves ovate to ovate-oblong, pinnately incised or lobed, the segments serrate to subentire.....35. *S. incisa*

1. SCROPHULARIA FARGESSI Franchet

Scrophularia fargesii Franch. in Bull. Soc. Bot. France **42**: 17. 1907; Diels in Bot. Jahrb. **29**: 565. 1900; Stiefelhaven in Bot. Jahrb. **44**: 458. 1910. Franchet's type was from eastern Szechuan: "Hab.—Chine occidentalis, prov. Su-tchuen, circa Tchen-keou-tin, alt. 2000 m. (Farges, n. 426).—Plante cultivée pour sa racine tubereuse qui est officinale."

Eastern Szechuan at an altitude of 2000 meters. Flowers greenish. Known from the original collection only. No specimen seen.

2. SCROPHULARIA KANSUENSIS Batalin

Scrophularia kansuensis Batalin in Act. Hort. Petrop. **13**: 381. 1894; Diels in Bot. Jahrb. **29**: 565. 1900; Stiefelhaven in Bot. Jahrb. **44**: 459. 1910.

Shensi and Kansu. Flowers yellowish (?). Flowering in June. No specimen seen.

3. SCROPHULARIA URTICAEFOLIA Wallich

Scrophularia urticaefolia Wall., List no. 3922, 1828–49; Benth., Scroph. Ind. **10**: 1825, in DC Prodr. **10**: 306. 1846; Stiefelhaven in Bot. Jahrb. **44**: 459. 1910.

Scrophularia forrestii Diels in Notes Bot. Gard. Edinb. **5**: 283. 1912. Diels' type was from western Yunnan: "Erect plant of 1–4 ft. Flowers green. Common inside the city of Teng Yueh growing in shady places. Very local. Lat. 25°N. Alt. 5600 ft. October 1905, G. Forrest No. 990." The holotype in the herbarium of the Royal Botanic Gardens, Edinburgh, has been seen.

Central to eastern Himalayas, Upper Burma, to western Yunnan, at altitudes of 1500–3000 meters. Flowers yellowish green. Flowering from June to October.

Yunnan: Teng Yueh, *G. Forrest 990* (RBGE).

An examination of the type of *S. forrestii* Diels shows that it is manifestly the same as *S. urticaefolia* Wall. of the Himalayas. This represents the easternmost extension of the range of the species.

4. SCROPHULARIA WILSONII Bonati

Scrophularia wilsonii Bonati in Bull. Soc. Bot. France **58**: 520. 1911. The type, "Habit.: Chine: Sze Tchuen: Ta-tsien-lou (Wilson n° 4304)," from Sikang, has not been seen.

Sikang. Flowers red. Flowering in May.

Sikang: No precise locality, *E. H. Wilson 3800* (USNH).

Wilson 3800 apparently belongs to this species although its leaves are more cordate and the corolla slightly larger than those in Bonati's original description. This species is closely related to *S. fargesii* Bonati and *S. urticaefolia* Wall. It is characterized by its axillary cymose inflorescences, more or less obtuse calyx-lobes with membranaceous slightly crenulate margins, and a red corolla.

5. SCROPHULARIA PETITMENGINII Bonati

Scrophularia petitmenginii Bonati in Bull. Soc. Bot. France **58**: 521. 1911. Bonati's types, "Habit.: Chine: Yunnan-Sen. Tchongchan. (Ducloux n° 3985);—Ve-gue-modja, pres Pin tchoun (Ducloux, n° 4744)," have not been seen.

"*Scrophularia elatior*" *sensu* Stiefelhaven in Bot. Jahrb. **44**: 459. 1910; Hand.-Max., Symb. Sin. **7**: 829. 1936; *non* Benth. An unnumbered collection of Ducloux, noted below, may be a specimen of one of these two collections. This synonym was first given by Handel-Mazzetti (loc. cit.).

Yunnan and Sikang at altitudes of 2500–2600 meters.

Yunnan: No data, *Ducloux s. n.* (ANSP, UCLA); Tong-tchouan, *E. E. Maire s. n.* (ANSP, NTU, UCLA), 7425 (ANSP, NTU, UCLA).

This species is readily distinguished from other related species by the long-exserted stamens and the acute calyx-lobes. The stem is quadrangular and somewhat winged. The inflorescences are in multi-flowered cymes, at the upper part of the stem or branches, forming seeming large panicles.

Scrophularia elatior Benth. is a coarser leaved plant of the Himalayas.

6. SCROPHULARIA BUERGERIANA Miquel

Scrophularia buergeriana Miquel in Ann. Mus. Bot. Lugd. Bat. **2**: 116. 1865; Kitamura in Acta Phyt. Geobot. **10**: 175. 1941; Yamazaki in Journ. Jap. Bot. **23**: 85. 1949.

Scrophularia oldhami Oliver in Journ. Linn. Soc. **9**: 167. 1865; Maxim. in Bull. Soc. Nat. Mosc. **54**: 36. 1879; Franch., Pl. David. 222. 1888; Forbes & Hemsl. in Journ. Linn. Soc. Bot. **26**: 179. 1890; Stiefelhaven in Bot. Jahrb. **44**: 1910; Pai in Contr. Inst. Bot. Nat. Acad. Peiping **2**: 185. 1934.

Japan, Korea and along the coast in China from Hopei to Kiangsu. Kiangsu: Kih Shan, near Nanking, *V. L. Keng 1933* (UC).

This species is found in Japan and also along the coastal provinces in China. It is readily distinguished from related species by the spike-like inflorescences with more or less sessile cymes. These resemble those of *S. spicata* Franch. of Yunnan but are not definitely arranged in whorls as in the latter and also the calyx-lobes are rounded instead of acute or acuminate.

7. SCROPHULARIA ALASCHANICA Batalin

Scrophularia alaschanica Batalin in Act. Hort. Petrop. **13**: 380. 1894; Stiefelhaven in Bot. Jahrb. **44**: 461. 1910; Pai in Contr. Inst. Bot. Nat. Acad. Peiping **2**: 183. 1934; Walker in Contr. U. S. Nat. Herb. **28**: 660. 1941. Batalin's type was from Ningshia: "Mongolia orientalis, pars media montium Alaschan, declivitas occidentalis, 23 Jun. 1873, flor., leg. Przewalski."

"*Scrophularia delavayi*" *sensu* Walker loc. cit. 660. 1941, *non* Franch. Based on *Ching 1149*.

Chinghai, Kansu, and Ningshia, at altitudes of 1375–2400 meters. Flowers greenish yellow. Flowering from May to June.

Ningshia: Ho Lan Shan Mountains, *R. C. Ching 76, 1149* (USNH).

This species has membranaceous and glabrous leaves, ovate-lanceolate in shape. The base is unequal, short and abruptly attenuate; the apex is acute; and the margins are irregularly and deeply dentate to more or less doubly dentate. The flowers are arranged in dense fascicles at a few nodes at the end of the stem and with rounded calyx-lobes and rather large (15 mm. long) corolla. As suggested by Batalin, this species is related to *S. moellendorffi* Maxim.; the latter, however, has smaller calyx with acute lobes and a smaller corolla only half as large.

8. SCROPHULARIA MANDSHURICA Maximowicz

Scrophularia mandshurica Maxim. in Bull. Soc. Nat. Moscou **54**: 35. 1879 (As. Orient. Fragm.); Stiefelhaven in Bot. Jahrb. **44**: 460. 1910. Maximowicz's types, "Hab. in Manshuria: ad Amur australem, ripa abrupta sylvo supra

kudjurko, in lapidibus rarissima, sub fine Julii frf., circa portum Brucei pratis litoreis non rara, nec non ad rivulos, silvarum passim, initio Augusti frf., (ipse)," were collected by F. Schmidt and himself.

Manchuria. No specimen seen.

This species has cordate leaves, shortly acuminate at the apex and irregularly serrate along the margins. The flowers are arranged in sessile or short-peduncled cymes on the upper part of the stem which often becomes leafless. The bracts are ovate and obtuse and the calyx-lobes ovate and acute. The corolla has reflexed lobes with the upper ones twice as long as the lower. The staminode is linear and very small. Maximowicz suggested that it may be related with *S. altaica* Murr. and *S. vernalis* L.

9. SCROPHULARIA SPICATA Franchet

Scrophularia spicata Franch. in Bull. Soc. Bot. France **47**: 14. 1907; Stiefelhaven in Bot. Jahrb. **44**: 459. 1910; Hand.-Maz., Symb. Sin. **7**: 829. 1936. Franchet's type, "Hab.—Chinese occidentalis: provincia Yunnan, in pratis humidis montis Yang-in-chan (Lan-kong), alt. 3000 m. (Delavay, n. 2364)," has not been seen.

Alpine meadows and ravines, at altitudes of 2800–3000 meters, in northwestern Yunnan. Flowers greenish yellow. Flowering in July.

Yunnan: Eastern slopes of Likiang Snow Range, *J. F. Rock* 4920 (NTU, NYBG, USNH); Likiang District, *C. W. Wang* 71062, 71564 (AA); Likiang Snow Range, *R. C. Ching* 30423 (AA); Chungtien Valley, *K. M. Feng* 1091 (AA); no precise locality, *T. T. Yü* 12552 (AA).

This is a distinct species readily recognized by the sessile cymes of short-pedicellate flowers, and the acute to acuminate calyx-lobes. The leaves are membranaceous, slightly scabrid on both surfaces, ovate-lanceolate in shape, with subacute apices and subcordate bases and with denticulate margins. The leaves are opposite. The lower cymes are arranged in definite and distant whorls while the upper ones are continuous.

10. SCROPHULARIA HENRYI Hemsley

Scrophularia henryi Hemsl. ex Forbes & Hemsl. in Journ. Linn. Soc. Bot. **26**: 178. 1890; Diels in Bot. Jahrb. **29**: 565. 1900; Stiefelhaven in Bot. Jahrb. **44**: 460. 1910. The type was from: "Hupeh: Kuei, on wooded precipices (*A. Henry!*). Herb. Kew." An isotype in the United States National Herbarium has been seen.

Scrophularia henryi Hemsl. var. ? *glabrescens* Hemsl. loc. cit.; Diels loc. cit. The type was from "Hupeh: Hsingshan (*A. Henry!*). Herb. Kew." An isotype in the New York Botanical Garden has been seen.

Hupeh: *A. Henry* 6180 (USNH), 6946 (NYBG).

This species is only found in western Hupeh and is strongly characterized by its few subspicately arranged flowers. The variety evidently is identical with the species and Stiefelhaven is justified in making the reduction.

11. SCROPHULARIA MOELLENDORFFI Maximowicz

Scrophularia moellendorffii Maxim. in Bull. Acad. Sci. Petersb. **26**: 500. 1800, in Mel. Biol. **10**: 683. 1880; Forbes & Hemsl. in Journ. Linn. Soc. Bot. **26**: 178. 1890; Stiefelhaven in Bot. Jahrb. **44**: 461. 1910; Pai in Contr. Inst. Bot. Nat.

Acad. Peiping 2: 184. 1934; Yamazaki in Journ. Jap. Bot. 23: 83. 1949. The type is from: "*China borealis*, prov. Pe-tschili, in m. Siao-wu-tai-shan, supra terminum silvarum, alt. 7500-9000 ped. (a Moellendorff)."

Chahar, Jehol and Shansi. No specimen seen.

Maximowicz originally assigned this species to the section *Tomio-phyllum* but Steifelhagen placed it in the *Anastomosantes*.

12. *Scrophularia campanulata* sp. nov.

Planta 35-45 cm. alta, caulibus simplicibus vel parce ramosis, flexuosis, parce puberulis, infra mox defoliatis; foliis oppositis petiolatis; petiolis 1.5-4 cm. longis, parce alatis, parce puberulis; lamina ovata 4.5-6 cm. longa, 3-4.5 cm. lata, apice acuta, basi late cuneata vel subtruncata, in sicco tenuiter membranacea, utrinque parce glanduloso-puberula, margine inciso-dentata, dentibus longe triangularibus ad 7-9 mm. longis, 3-4 mm. latis, acuminatis, integris vel denticulatis, inflorescentiis spicatis terminalibus 5-10 cm. longis, parce puberulis; floribus in verticillastos 1-3 subdensos ad 6-flos aggregatis; pedicellis erectis 5-10 mm. longis, parce puberulis, bracteis lanceolatis longe acuminatis ad 10 mm. longis, parce puberulis; calycibus 6-7 mm. longis, obliquis, ad medium 5-lobatis, lobis ovatis acutis vel acuminatis, extra glabris vel parvissime puberulis; corolla flava, 9-10 mm. longa, 7-9 mm. lata, intus dense villosa, extra glabra, tubo fere aequaliter campanulato, circiter 6 mm. longo, superne ciliato, lobo summo 3-4 mm. longo, alte bilobo, lobis rotundatis plerumque abrupte subacutis, lobis lateralibus et antico 3-3.5 mm. longis, erectis, linearibus acutis; staminibus inclusis, filamentis glabris; staminodio orbiculare; stylo circiter 6 mm. longo, glabro, ovario glabro.

Type, on open ledge, Ah-nar-koo, northwest of Likiang, northwestern Yunnan, collected in flower, June 1st, 1939, by R. C. Ching, No. 20654; holotype in the herbarium of Arnold Arboretum, photo at Academy of Natural Sciences of Philadelphia. Flowers yellow. Only collection seen.

This new species and another, *S. muliensis*, are distinguished from other Chinese species by their broad, campanulate corolla with the upper lip only slightly longer than the lower. In this latter character, they resemble somewhat *S. moellendorffii* Maxim. of northern China, of which no specimen has been seen. From the description, the latter differs from these two new species notably in the shorter petiole leaves and the shorter pedicellate and more densely arranged flowers.

13. *Scrophularia muliensis* sp. nov.

Planta 30-35 cm. alta, caulibus simplicibus vel parce ramosis erectis flexilibus glabris vel parce pubescentibus, rhizomate lignoso ad 10 cm. longo; foliis oppositis petiolatis; petiolis ad 1.5 cm. longis, parce altis, parce pubescentibus; lamina ovata, 3-5 cm. longa, 1.5-3 cm. lata, apice acuta, basi late cuneata, margine irregulariter magnitudine serrata, in sicco tenuiter membranacea, utrinque parce puberula, reticulato nervosum conspicuo; inflorescentiis spicatis terminalibus 5-10 cm. longis, parce pubescentibus, floribus in verticillastos 1-3 laxos ad 5-flos dispositis, pedicellis, erectis, 5-10 mm. longis, puberulis;

bracteis lanceolatis, ad 10 mm. longis, parce puberulis; calycibus 3-4 mm. longis obliquis, ad medium 5-labotis, lobis ovatis, acutis vel acuminatis, extra glabris vel parcissime puberulis; corolla flava, 9-10 mm. longa, 6-7 mm. lata, intus dense villosa, extra glabra, tubo fere aequaliter campanulato, 6 mm. longo, superne ciliato, lobo summo 3-4 mm. longo, alte bilobo, lobis rotundatis, lobis lateralibus et antico 3-3.5 mm. longis erectis linearibus acutis; staminibus inclusis, filamentis glabris; staminodio orbiculare; stylo circiter 6 mm. longo, glabro; ovario glabro.

Type, along brook, at an altitude of 3700 meters, on Mount Mitzuga, west of Muli Gomba, Muli Territory, Sikang Province, collected in flower, June, 1928, by J. F. Rock, No. 16048; holotype in the United States National Herbarium; isotypes in the herbaria of the Academy of Natural Sciences of Philadelphia (with photographs) and the Arnold Arboretum.

Along brooks or edge of forests at altitudes of 3050-4875 meters, in the Muli Territory, Sikang Province. Flowers yellow. Flowering in June.

Sikang: Muli, *J. F. Rock 5569* (ANSP, USNH); Mount Mitzuga, Muli, *J. F. Rock 16048* (AA, ANSP, USNH), 16227 (USNH).

This species is closely related to *S. campanulata* of adjacent north-western Yunnan. They resemble each other in the glabrate to glabrous habit, membranaceous, deeply serrate leaves, more or less long-pedicellate laxly arranged flowers, acute to acuminate calyx-lobes, and broadly expanded corolla with the upper lips only slightly longer than the lower. *Scrophularia muliensis* differs, however, in having an erect stem, smaller leaves with shorter petioles and shallower serrations, and smaller corollas.

14. SCROPHULARIA CHASMOPHILA W. W. Smith

Scrophularia chasmophila W. W. Smith in Notes Bot. Gard. Edinb. **13**: 181. 1921; Hand.-Maz., Symb. Sin. **7**: 830. 1936. Smith's types were from Yunnan: "West China:—Mountains in the N. E. of the Yangtze bend, Yunnan, on stony pasture, in rhododendron thickets, and on ledges of cliffs. Lat. 27° 45' N. alt. 13000 ft. Plant of 7-24 inches. Flowers dull green-yellow. July 1913: G. Forrest. Nos. 10380 and 10515. Eastern flank of the Lichiang Range, in rocky situation in rhododendron scrub. Lat. 27° 30' N. Alt. 14-15000 ft. Plant of 6-9 inches. In seed. September 1910. G. Forrest. No. 6658." Duplicates of both numbers, in the Edinburgh Herbarium, are available for study. No. 10380 was designated by Smith as the type.

Rocky situations in thickets, at altitudes of 3000-4875 meters, in south-eastern Sikang and northwestern Yunnan. Flowers yellow. Flowering in June and July.

Sikang: Muli Territory, *J. F. Rock 5556* (UC, USNH); Mt. Mitzuga, west of Muli Gomba, *J. F. Rock 16217* (AA, ANSP, USNH); western slopes of Mt. Mitzuga, *J. F. Rock 24510* (MBG, NYBG, UC, UP, USNH). Yunnan: Eastern flank of Likiang Range, *G. Forrest 6658* (RBGE); northeast of the Yangtze bend, *G. Forrest 10380* (UC, RBGE), 10515 (UC).

This species is allied to *S. delavayi* Franch. and *S. alaschanica* Batalin. It can be differentiated from the former by the glandular calyx. From the latter, it can be distinguished by the long woody rhizome, the more branched habit, the much smaller and less acute

leaves which are sparsely pilose, and the more densely aggregated flowers.

15. *Scrophularia nana* sp. nov.

Planta nana, ad 10 cm. alta, caulibus simplicibus vel pauci ramosis, flexilibus glabris vel parce minute puberulis infra mox defoliatis squamosis, rhizomate lignoso valde elongato ad 30 cm. longo; foliis oppositis petiolo ad 6 mm. longo glabrato praeditis, lamina cordata vel late ovata, 0.7–1.3 cm. longa, 0.6–1.3 cm. lata, apice obtusa vel subrotundata, basi cordata vel late cuneata, margine sparse inconspicueque crenato-dentata, in sicco membranacea, utrinque sparse pilosula, reticulo nervorum sparso conspicuo; inflorescentiis spicatis terminalibus subsessilibus subcapitatis parvis sparse glanduloso-pilosis, floribus in verticillastos 1–2 densos ad 5-flosos aggregatis, pedicellis 2–3 mm. longis glabris; bracteis linearis, 4–5 mm. longis, pilosis; calycibus 4–5 mm. longis, ad basim 5-lobatis, lobis oblongo-ovatis, apice subacutis vel obtusis extra longe glanduloso-pilosis; corolla flava, circiter 15 mm. longa, 6–7 mm. lata, extra parce glanduloso-pilosa; tubo fere aequaliter cylindrico 10 mm. longo, lobo summo 5 mm. longo alte bilobo, lobis rotundatis, lobis lateralibus et antico 2 mm. longis erectis; staminibus inclusis, filamentis parce minute glanduloso-pilosulis; staminodio orbiculare vel lineare; stylo circiter 11 mm. longo, sparse minuteque glanduloso; ovario glabro.

Type, alpine meadow, at an altitude of 3950–4270 meters, Alété, eastern slopes of Likiang Snow Range, Yangtze watershed, District of Likiang, Yunnan, collected in flower, May–October, 1922, by J. F. Rock No. 4642; holotype at the Academy of Natural Sciences of Philadelphia; isotypes in the herbarium of the National Taiwan University, and the United States National Herbarium.

This is a remarkably dwarf plant in the genus. It is related to *S. chasmophila* W. W. Smith, resembling the latter in the long lignose rhizomes, in the general habit, and in the corolla structures. However, it can be readily distinguished by its small size, small and relatively shorter and broader leaves, shorter and denser inflorescences, shorter calyx-lobes, and broader and less hairy corolla.

16. *SCROPHULARIA DELAVAYI* Franchet

Scrophularia delavayi Franch. in Bull. Soc. Bot. France **47**: 15. 1900; Stiefelhagen in Bot. Jahrb. **44**: 461. 1910; Hand.-Maz., Symb. Sin. **7**: 829. 1936. Franchet's type: "Hab.—China occidentalis: Yunnan, in saxosis humidis calcareis inter saxa delabentia montis Tsang-chan, supra Tali, altit. 3000 m. (Delavay, n. 865); in umbrosis ad collum Yentze-hay, alt. 3200 m. (id.)," has not been seen. An unnumbered collection of Delavay, noted below, may be of the type collection.

Alpine meadows at altitudes of 2700 to 3660 meters, in northwestern Yunnan. Flowers bright yellow to orange yellow. Flowering in May and June.

Yunnan: No precise localities, *Delavay* s. n. (ANSP, UCLA), *T. T. Yü 5717* (AA); Tali Range, *G. Forrest 19406* (UC, USNH); Mekong-Salween divide, *G. Forrest 19745* (UC, USNH); Salween-Irrawadi divide, *H. Handel-Mazzetti 9316* (USNH); eastern slopes

of Likiang Snow Range, *J. F. Rock 3513* (ANSP, USNH); Sung-kwe pass between Likiang and Hokin, *J. F. Rock 25189* (MBG, NYBG, UC, UP, USNH); Ta-li district, *C. W. Wang 63266* (AA); Salween-Kiukiang divide, *T. T. Yü 19380* (AA).

The range of this species is apparently limited to northwestern Yunnan. This species is related to *S. alaskanica* Batalin, but can be distinguished, besides other characters, by its glabrous instead of glandular-pubescent calyx and more acute calyx-lobes.

17. *Scrophularia hypsophila* Handel-Mazzetti

Scrophularia hypsophila Hand.-Maz. in Sitz. Akad. Wiss. Wien **62**: 238. 1925, Symb. Sin. **7**: 830. 1936. Handel-Mazzetti originally cited two collections: "Prov. Yunnan: Prope fines Tibeto-Birmanicas in reg. alpina inter fluviros Salwin et Irrawadi in latere occid. jugi Tschiang-schel in cespite legi 4. VII. 1916 (nr. 9282) et glarea declivium ad sept. jugi Buschao legi 10. VII. 1916 (nr. 9496). S. micoschistaceo et granitico, 4050-4100 m."

I have seen no specimen of this species. It may prove to be very close to or even identical with *S. rockii*.

18. *Scrophularia rockii* sp. nov.

Planta 15-20 cm. alta, caulibus pauci ramosis, flexilibus glabris infra mox defoliata squamosis, rhizomate lignoso valde elongato ad 35 cm. longo; foliis oppositis vel superne suboppositis vel alternis, petiolo ad 3-4 mm. longo glabrato praeditis; lamina late ovata vel ovata, 1.7-1.8 cm. longa, 1-1.6 cm. lata, apice acuta basi abrupte in petiolorum angustata margine distincte acute dentata, in sicco membranacea, utrinque glabra, reticulo nervorum sparse conspicuo; inflorescentiis spicatis terminalibus ad 2.5 cm. longis glabris, floribus subremote aggregatis non-verticillatis, pedicellis ad 2 mm. longis glabris; bracteis linearibus ad 1 cm. longis glabris; calycibus 4-5 mm. longis obliquis ad basim 5-lobatis, lobis ovatis apice subacutis vel obtusis, glabris; corolla flava, circiter 1-1.2 cm. longa, 4 mm. lata, extra glabra, tubo fere aequaliter cylindrico 7-8 mm. longo, lobo summo 3 mm. longo alte bilobo, lobis rotundatis, lobis lateralibus et antico 1.5 mm. longis erectis; staminibus inclusis filamentis glabris; staminodio lineare; stylo circiter 7 mm. longo, glabro; ovario glabro; capsularis calyce inclusis.

Type, among gravel and scree, at an altitude of 4270 meters, on the northern slopes of Mt. Kenichunpo, north of Sikitung, Upper Salween River, Sikang Province, collected in flower, May-June, 1932, by J. F. Rock, No. 22148; holotype in the United States National Herbarium; isotype in the herbaria of the New York Botanical Garden, University of California, and University of Pennsylvania.

This species is related to *S. delavayi* Franch., differing, however, in the longer rhizomes, smaller leaves, broader calyx-lobes and smaller and narrower corolla-lobes. In the general habit, it also resembles *S. chasmophila* W. W. Smith, but is readily distinguished from the latter by its glabrous calyx.

19. *Scrophularia yunnanensis* Franchet

Scrophularia yunnanensis Franch. in Bull. Soc. Bot. France **47**: 12. 1907; Stiefelhagen in Bot. Jahrb. **44**: 460. 1910. Franchet's types were from north-

western Yunnan: "Hab.—China occidentalis, Yunnan, in silvis ad collum Kona-lo-po, alt. 3000 m. (Delavay, n. 2167); in silvis ad Kichan prope Ta-pin-tze (id., n. 4021)." Duplicates of the first number have been seen.

Stony meadows and forests, at altitudes of 3000–3650 meters, in northwestern Yunnan. Flowers green. Flowering in July.

Yunnan: Hokin, Kona-lo-po, *Delavay 2167* (ANSP, UCLA); Chien-chuan-Mekong Divide, *G. Forrest 21568* (UC, USNH).

This is a plant of low habit covered with more or less dense and long hairs. The leaves are oppositely arranged on the short stem, ovate in shape, with usually subcordate to truncate bases, obtuse apices, and doubly crenate-dentate margins. The stem is terminated by an inflorescence of a few cymes of 2–5 flowers each. The flowers have rounded calyx-lobes and greenish corolla.

20. SCROPHULARIA SOULIEI Franchet

Scrophularia souliei Franch. in Bull. Soc. Bot. France **47**: 15. 1907; Stiefel-hagen in Bot. Jahrb. **44**: 461. 1910. Franchet's type was based on a collection made by Soulie: "Hab.—China occidentalis: prov. Su-tchuen a Tongolo, dans les champs et les jardins." A duplicate, evidently isotype, in the Bonati Herbarium was seen, and will be divided between the three herbaria listed below.

Sikang. Flowers dark colored. Known from the original collection only.

Sikang: Tongolo, *Soulie s. n.* (ANSP, NTU, UCLA).

This is a distinct species and a dwarf member of the genus. It attains to an height of 15 cm. The rootstock is characteristically bulbous. The leaves are broadly ovate with subtruncate to shortly attenuate base and obtuse apex and are subentire or with a few large teeth on the margins. The inflorescence is a pyramid-shaped panicle with short pedicellate flowers. The flowers bear more or less rounded calyx-lobes and a very small corolla (2–3 mm. long).

21. SCROPHULARIA AMGUNENSIS F. Schmidt

Scrophularia amgunensis F. Schmidt in Mem. Acad. Sci. St. Petersburg. VII. **12**(2): 57. 1868 (Reisen im Amur-lande I. Florula Amg. Bur. n. 288. t. 1, fig. 2, 3); Maxim. in Bull. Soc. Nat. Moscou **54**: 34. 1879 (As. Orient. Fragm.); Stiefel-hagen in Bot. Jahrb. **44**: 462. 1910.

Manchuria. Flowers greenish. Flowering in May.

No specimen seen. In the incised serrate leaves, this species resembles *C. incisa* Weinm. but the latter belongs to a different section Tomiophyllum, which has non-reticulate leaves. It also differs in being a glabrous or glabrate plant with much smaller flowers, very slightly exserted stamens, and ovate-oblong leaves with cuneate bases. The range of this species is also much more eastern than that of *S. incisa*.

22. SCROPHULARIA MICRODONTA Franchet

Scrophularia microdonta Franch. in Bull. Soc. Bot. France **47**: 11. 1907; Diels in Bot. Jahrb. **29**: 565. 1900; Stiefel-hagen in Bot. Jahrb. **44**: 458. 1910; Li in Taiwania **1**: 164. 1950. The type is a Farges collection: "Hab.—China occidentalis, prov. Su-tchuen, circa Tchen-keou-tin (Farges)." A specimen, *Farges 374 bis*, bearing these data and presumably an isotype, is in the University of California in Los Angeles with photo at Academy of Natural Sciences of Philadelphia.

Szechuan. Flowers purple. Flowering in August.

Szechuan: Mt. Omei, C. Y. Chiao & C. S. Fan 430 (AA), W. P. Fang 19095 (NTU).

This species is related to *S. ningpoensis* Hemsl. and *S. grayana* Maxim. but can be distinguished by its short petiolate leaves and very finely denticulate along the margins.

23. SCROPHULARIA FORMOSANA Li

Scrophularia formosana Li in Quart. Journ. Taiwan Mus. **3**: 68. 1950. The type, "Taiwan, Keihan, Taroko, collected by S. Suzuki, No. 8613, Oct. 31, 1931," is in the herbarium of the National Taiwan University.

Taiwan, endemic in the Taroko mountains. See Li (loc. cit.) for citation of specimens.

24. SCROPHULARIA YOSHIMURAE Yamazaki

Scrophularia yoshimurae Yamazaki in Journ. Jap. Bot. **23**: 86. 1949.

"*Scrophularia duplicato-serrata*" sensu Hay., Gen. Ind. Fl. Formos. **53**. 1916; Nemoto, Fl. Jap. Suppl. 667. 1936, p.p.; Mori in Masamune, Short Fl. Formos. **192**. 1936; Li in Quart. Journ. Taiwan Mus. **3**: 68. 1950; non Makino.

"*Scrophularia alata* Gray β *duplicato-serrata*" sensu Hay. in Journ. Coll. Sci. Imp. Univ. Tokyo **25** (19): 173. 1908 (Fl. Mont. Formos.), non Miquel.

Endemic in Taiwan; in mountainous regions. See Li (loc. cit.) for citation of specimens.

Yamazaki separates the Taiwan plant from the Japanese *S. duplicato-serrata* (Miq.) Makino, basing it on the type from Mt. Arisan, collected by Yoshimura in 1941, in the herbarium of Tokyo University. The Taiwan plant is more rigid, with thicker leaves having finer serrations along the margins, more ovate capsules, and 2-8 flowers at each leaf-axils instead of only 1-3.

25. SCROPHULARIA NINGPOENSIS Hemsley

Scrophularia ningpoensis Hemsl. ex Forbes & Hemsl. in Journ. Linn. Soc. Bot. **26**: 178. 1890; Merrill in Lingnam Agr. Rev. **4**: 135. 1927; Pai in Contr. Inst. Bot. Nat. Acad. Peiping **2**: 184. 1934; Hand.-Maz., Symb. Sin. **7**: 830. 1936; Yamazaki in Journ. Jap. Bot. **23**: 85. 1949. The type was from: "Chekiang: mountains of Ningpo (*Faber!*). Herb. Kew." A duplicate of the type collection, *Faber 1615*, in the herbarium of the New York Botanical Garden, has been seen.

Roadside, hill slopes, or shaded ravines at altitudes of 100-1200 meters, in southeastern China. Flowers purplish brown. Flowering in July and August.

Chekiang: Ningpo mountains, *Faber 1615* (NYBG); Nin-hai District, Y. H. Keng 1097 (UC). Anhwei: West of Siunin, R. C. Ching 8837 (UC, USNH); Wu Yuan, R. C. Ching 8944 (UC, USNH). Kiangsi: Kien-nan District, S. K. Lau 4373 (GH, USNH); Lungnan District, S. K. Lau 4683 (GH, USNH); Loushan, Y. Tsiang 10314 (NYBG). Funken: Northern Fukien, near the Chekiang border, R. C. Ching 2277 (NYBG, UC, USNH); Diongloh, Lin Yu Tai 11747 (UC). Kwangtung: Canton, North West River, C. Ford s. n. (MBG, USNH); Lungtau Shan, To & Tsang 12810 (ANSP, MBG, NY, UC, USNH); Ying Tak, Y. K. Wang 2844 (NYBG).

This species has a fairly wide range in southeastern China in all coastal provinces. It is apparently related to *S. nodosa* L. Stiefel-hagen reduced *S. ningpoensis* to a synonym of *S. nodosa* but Handel-

Mazzetti is evidently justified in maintaining it as a distinct species. Compared with *S. nodosa*, it has more slender and longer pedicels, shorter petioles, and less cordate bases.

26. SCROPHULARIA NODOSA Linnaeus

Scrophularia nodosa L., Sp. Pl. 619. 1753; Franch. in Bull. Soc. Bot. France **47**: 13. 1907; Stiefelhaven in Bot. Jahrb. **44**: 461. 1910; Hand.-Maz., Symb. Sin. **7**: 830. 1936.

Europe, Siberia, to North America. Recorded also in northwestern Yunnan. No specimen from China seen.

Franchet recorded this species, basing it on *Delavay* 96 from Lan-Kong, as occurring in Yunnan, but mentioned some differences between this and other European specimens. Stiefelhaven considered *S. ningpoensis* Hemsl., here treated as distinct, of southeastern China, as identical with this species. I have seen no specimen to verify the record of occurrence of this species in northwestern Yunnan.

27. SCROPHULARIA GRAYANA Maximowicz

Scrophularia grayana Maxim. ex Komarov in Act. Hort. Petrop. **25**: 16. 1907; Stiefelhaven in Bot. Jahrb. **44**: 468. 1910.

Scrophularia alata A. Gray in Mem. Am. Acad. N. S. **4**: 401. 1858-59; Diels in Bot. Jahrb. **29**: 565. 1900; Pai in Contr. Inst. Bot. Nat. Acad. Peiping **2**: 183. 1934; *non* Gil.

Japan, southern Manchuria, and Hopei.

Hopei: Kuan Tso Ling, *J. C. Liu* 1160 (UC).

This is a Japanese species that occurs also in northern China, in Hopei, and southern Manchuria. Diels (loc. cit.), recorded it from southern Szechuan, a record which cannot be verified.

28. *Scrophularia crenatosepala* sp. nov.

Planta 35 cm. alta, caulibus simplicibus, glabris, basi squamosis; foliis oppositis petiolatis, petiolis 2-3 cm. longis glabris, valde alatis; limina ovata vel oblongo-ovata, 4.5-8.5 cm. longa, 3-4.5 cm. lata, apice rotundata, base rotundata vel subcordata, margine simpliciter vel dupliciter acute serrata, in sicco membranacea, utrinque valde parcissime puberula, reticulo nervorum subconspicuo; inflorescentiis paniculatis, terminalibus 5-10 cm. longis glabris vel parcissime puberulis; floribus in cymos sublaxos multifloros aggregatis; pedicellis 3-5 mm. vel ultra longis minute puberulis; bracteis lanceolatis 3-10 mm. longis; calycibus ad 8 mm. longis, obliquis, ad basim 5-lobatis, lobis oblongo-ovatis acutis, margine inconspicuo crenulatis, utrinque glabris; corolla virida, ad 1.2 cm. longa utrinque glabra, tubo inflato circiter 5-7 mm. longo, lobo summo 5 mm. longo, alte bilobo, lobis rotundatis, lobis lateralibus et antico 1.5 mm. longis; staminibus inclusis, filamentis glabris; staminodio orbiculare; stylo 7 mm. longo glabro; ovario glabro.

Type, on open hills, Shiang-shu-ho by Mar-erh-shan near Sung-Kwei, Hokin, northwestern Yunnan, collected in flower, April 20, 1930, by K. M. Feng, No. 744; holotype in the herbarium of the Arnold Arboretum, phototype at the Academy of Natural Sciences of Philadelphia. Flowers green. Only collection seen.

This species approaches closely *S. diplodonta* Franch. but is readily distinguished by its winged petioles and the distinctly crenulate calyxlobes.

29. SCROPHULARIA DIPLODONTA Franchet

Scrophularia dipdonta Franch. in Bull. Soc. Bot. France **47**: 14. 1907; Stiefel-hagen in Bot. Jahrb. **44**: 466. 1910. A duplicate of the type: "Hab.—China occidentalis: Yunnan, ad margines silvarum prope collum Lo-pin-chan (Lan-kong), alt. 3200 m. (Delavay, n. 2334)," has been seen. A photograph of it is at the Academy of Natural Sciences of Philadelphia.

Mountain slopes at altitudes of 3000–3600 meters, in northwestern Yunnan. Flowers greenish. Flowering in May.

Yunnan: Lo pin chan, Lan-kong, *Delavay 2334* (UCLA); Wei-si District, *C. W. Wang 68560* (AA); no precise locality, *H. T. Tsai 57668* (AA).

Franchet also described a variety of *S. dipdonta* var. *tsanchanensis* Franch. loc. cit. 15, based on *Delavay 4170*, differing from the type in having larger leaves usually simply dentate along the margins.

This species is characterized by the membranaceous, long and narrow leaves with truncate to attenuate bases, long acuminate apices and doubly serrate margins. The inflorescence is paniculate and few-flowered. The flowers have acute calyx-lobes and a greenish corolla. The stem is provided with scaly leaves at its base.

30. SCROPHULARIA MANDARINORUM Franchet

Scrophularia mandarinorum Franch. in Bull. Soc. Bot. France **47**: 13. 1907; Stiefel-hagen in Bot. Jahrb. **44**: 462. 1910. The types: "Hab.—China occidentalis: Yunnan, in sylvis ad Ta-long-tan prope Ta-pin-tze, alt. 1800 m. (Delavay, n. 2396); in monte Chetcho-tze (id.)," have not been seen.

Northwestern Yunnan. Flowers greenish. Known from the original collections only. No specimen seen.

31. SCROPHULARIA DUCLOUXII Stiefel-hagen & Bonati

Scrophularia duclouxii Stiefel-hagen & Bonati ex Bonati in Bull. Soc. Bot. France **58**: 521. 1911. The type from Yunnan, "Habit: Chine: Yunnan: Pata-ousan, près Pin-tchouan (*J. Py. Ducloux* n° 5352), fl. juillet," has not been seen.

Northwestern Yunnan. Flowers yellow or greenish. Flowering in July.

Yunnan: Shunning, Hila, Wumulung, *T. T. Yü 16702* (AA).

The specimen referred to this species has been identified solely on the basis of the original description. Shunning is in the southwest of Pin-chuan, the type locality of the species.

32. SCROPHULARIA STIEFELHAGENII Bonati

Scrophularia stiefelhagenii Bonati in Bull. Soc. Bot. France **58**: 522. 1911. The type, "Habit: Chine occidentale (*Wilson* n° 4206, juill. 1903)," has not been seen.

Western China. Flowers greenish. Flowering in July. Known from the original collection only. No specimen seen.

33. SCROPHULARIA PRZEWALSKII Batalin

Scrophularia przewalskii Batalin in Acta Hort. Petrop. **13**: 382. 1894; Stiefel-hagen in Bot. Jahrb. **44**: 469. 1910; Marquand & Shaw in Journ. Linn. Soc. Bot. **48**: 210. 1929. The types were "*Tibet boreali-orientale*: declivitas australis divoitiu fluv. Hoangho et Yantze-Kiang, 14,000'; Mai 29. 1884; montes ad fluv. Be-tschii brachii sinistri fl. Yantze-Kiang, 15,300', Juni 13. 1884 (*Przewalski*)."
They have not been seen.

Chinghai and western Sikang. Flowers yellow. Flowering in May and June.

This species, as described by Batalin, belongs to the section Tomiophyllum Benth., but the leaf-veins are sometimes anastomosing. No specimen seen.

34. SCROPHULARIA CRETACEA Fischer

34a. SCROPHULARIA CRETACEA CRETACEA

Scrophularia cretacea Fisch. ex Wydler in Mem. Soc. Phys. Hist. Nat. Genève 166, t. 4. 1828; Stiefelhaven in Bot. Jahrb. **44**: 476. 1910.

Scrophularia canescens Bongard in Bull. Acad. Sci. Petersb. **8**: 430. 1841; Benth. in DC. Prodr. **10**: 316. 1846; Pai in Contr. Inst. Bot. Nat. Acad. Peiping **2**: 184. 1934.

The typical form of the species occurs from Russia to Siberia and Dzungaria.

34b. SCROPHULARIA CRETACEA GLABRATA

Scrophularia cretacea Fisch. var. *glabrata* (Franch.) Stiefelhaven in Bot. Jahrb. **44**: 477. 1910. Based on the following.

Scrophularia canescens Bongard var. *glabrata* Franch., Plant. David. **1**: 221. 1884. Franchet's type is from: "Ourato, bords du torrent de Kuenti-leen dans le sable," collected by David. It has not been seen.

Sandy steppe near rivers in Ningshia and Chahar. Flowers purple. Flowering in July and August.

Chahar: *Roehrich Exp. 861* (USNH).

Stiefelhaven combined the two species, *S. cretacea* Fisch. and *S. canescens* Bongard. The typical form of the species occurs in Russia and Siberia, extending just barely to the border of Sinkiang. Franchet's variety was described from "Ourato," the Ho Lan Shan of Ningshia province. A specimen from Chahar in the east, is clearly referable to this variety. It is a more glabrate form of the species.

35. SCROPHULARIA INCISA Weinmann

Scrophularia incisa Weinm., Enum. Pl. Hort. Dorpat. 136. 1810; Meyer & Bunge, Fl. Altaica **2**: 442. 1830; Stiefelhaven in Bot. Jahrb. **44**: 478. 1910; Rehder & Kobuski in Journ. Arnold Arb. **14**: 32. 1933; Pai in Contr. Inst. Bot. Nat. Acad. Peiping **2**: 184. 1934; Walker in Contr. U. S. Nat. Herb. **28**: 660. 1941; Yamazaki in Journ. Jap. Bot. **23**: 83. 1950.

"*Scrophularia orientalis*" sensu Maxim. Mem. Acad. Sci. Petersb. Sav. Etrang. **9**: 484. 1859 (Ind. Fl. Mongol.); non L.

Siberian Altai to northwestern China in Chinghai and Kansu. Moist sandy soil at altitudes of 1500-2300 meters. Flowers violet. Flowering in June and July.

Mongolia: Tsagan Nor, *R. W. Chaney 172* (NYBG, UC, USNH); Artsa Bogdo, *R. W. Chaney 396* (UC, USNH). Sinkiang: Near Lake Saisang Nor, *Herb. Acad. Petrop. s. n.* (ANSP); Dschabyk, *A. G. Schrenk 1075* (ANSP). Chinghai: Radja and Yellow River Gorges, *J. F. Rock 14003* (NYBG, USNH). Kansu: Hsia Mo K'ou, near Lichen, *R. C. Ching 364* (ANSP, USNH).

The range of this species extends from the Altai region in Siberia to Mongolia and northwestern China. It is readily distinguished from other species by the incised leaves.

Taxonomic Notes on the Ustilaginales II*

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The present notes include observations on some smut fungi, mostly from tropical Africa. Although this group of fungi has been explored very little in Africa, this continent with its many grass hosts is the type locality of many species described by earlier mycologists, some of which have remained poorly known or have been misinterpreted. Efforts have been made to re-examine these species in order to ascertain their identity and geographic ranges. The recent collections made by P. O. Wiehe from Nyasaland, which yielded a number of previously unrecorded species, are particularly interesting as they indicate the almost unlimited prospect for future explorations and studies in this region. In addition a few species from other continents are cited.

The writer is indebted to the following for the opportunity of studying materials pertinent to this investigation: Dr. M. B. Ellis, Dr. J. C. Lindquist, Dr. C. Moreau, Prof. R. Pichi-Sermolli, Prof. W. Robyns, Sir Edward Salisbury, Dr. P. G. Valder, and Dr. S. P. Wiltshire. He is especially grateful to John A. Stevenson for his valuable help and a review of the manuscript, and to Edith K. Cash for preparing the Latin diagnoses.

Herbaria where the specimens cited are located are referred to according to the following abbreviations: BPI = Mycological Collections, Bureau of Plant Industry; BR = Jardin Botanique de L'Etat, Brussels; CH = Clinton Herbarium, Connecticut Agricultural Experiment Station; CMI = Commonwealth Mycological Institute, Kew; FL = Herbarium Universitatis Florentinae; K = Royal Botanic Gardens, Kew; LP = Instituto de Botanica "Spegazzini," Universidad Nacional de La Plata; P = Museum National d'Histoire Naturelle, Paris; PRM = Mycological Herbarium, Union Department of Agriculture, Pretoria; US = U. S. National Museum. Where the location is not given, the specimen is in the writer's personal collection.

Ustilago chloridionis sp. nov.

Soris in ovariis, spiculas omnes inflorescentiae inficientibus, inter glumas tectantes partim expositis, 1.5–2 mm longis, soro quoque membrana tenui hospitis tecto; sporis ad basim sori agglutinatiss, sphericis usque ovalibus, interdum subangularibus, 8–11 x 7.5–10 μ ; episporio pallide vel rare valde rubro-brunneo, 0.5 μ crasso, minute sed abundanter punctato; endosporio granuloso.

Sori in ovaries, infecting all the spikelets of an inflorescence, partially exposed between enveloping glumes, 1.5–2 mm. long, each covered by a thin membrane of host origin. Spores agglutinate at the basal part of the sorus, spherical to oval, occasionally slightly angular, 8–11 x 7.5–10 μ ; episporium light reddish brown, rarely deeper, 0.5 μ thick,

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minutely but abundantly punctate under higher magnifications; endospore with granular contents.

On *Chloridion cameronii* Stapf, Northern Province, Vipya grassland, Nyasaland, Oct. 1950, G. Jackson, type (CMI 44452).

USTILAGO PANICI-GRACILE MacKinnon, Jour. Proc. Roy. Soc. N. S. Wales **46**: 202. 1912.

Ustilago clelandii Syd., Ann. Myc. **35**: 24. 1937.

On *Paspalidium gracile* (R. Br.) Hughes, Nyngan, New South Wales, Australia, 1911, E. MacKinnon, type; Bluff, Encounter Bay, South Australia, Jan. 28, 1936, J. B. Cleland, type of *U. clelandii* (BPI).

USTILAGO QUITENSIS Lagerh. Bull. Herb. Boiss. **3**: 62. 1895.

Ustilago cortaderiae Grods. ex Hirschh., Darwiniana **3**: 368. 1939.

On *Cortaderia dioica* (Spreng.) Speg., Las Lajas, Neuquen, Argentina, Feb. 1936, R. Spegazzini & E. Hirschhorn, type of *U. cortaderiae* (LP 3080).

The type of this species was collected in Ecuador on *Cortaderia selloana* (Schult.) Aschers. & Graebm. (= *Gynerium argenteum* Nees).

***Ustilago setariae-mombassanae* sp. nov.**

Sori in ovariis, spiculas isolatas plerumque ad basim paniculae inficientibus et eas hypertrophis, globodeis, 3-4 mm in diam., sori quoque membrana lenta persistenti e textura hospitis composita lobatim fissenti tecto; sporis plerumque subsphericis vel ovoideis, interdum late ellipsoideis vel irregularibus, 6-7.5 μ in diam. vel 6-10 x 5-5.7 μ , pallide olivaceo-brunneis, sparse punctatis, endosporio vacuolato.

Sori in ovaries, infecting isolated spikelets mostly at the lower part of the panicle, causing hypertrophy, globoid, 3-4 mm. diam., each enclosed by a tough, persistent membrane of host tissue, rupturing later into lobes. Spores mostly spherical, subspherical or ovoid, sometimes broadly ellipsoid or somewhat irregular, 6-7.5 μ diam., or 6-10 x 5.5-7 μ , light olivaceous brown, sparsely punctate under higher magnifications, endospore vacuolate.

On *Setaria mombassana* Herrm., Chitala to Samlima Road, Nyasaland, 22 Mar. 22, 1949, P. O. Wiehe 69, type (CMI 34947).

***Sphacelotheca andropogonis-schirensis* sp. nov.**

Sori in ovariis, spiculas omnes racemi infecti destruentibus, ellipsoideis, 2-3 mm longis, inter glumas patentes expositis, sori quoque membrana falsa crassa brunneoli tecto; membrana ex apice fissenti et massam sporarum obscure purpuream subagglutinatum columellam attenuatam circumdantam detegenti; cellulis sterilibus membranae plerumque subglobosis usque ellipsoideis, 7-15.5 x 6-13.5 μ , tunica circa 1 μ crassa; sporis sphericis usque late ellipsoideis, 7-12 x 6-9 μ , medio 8.7 x 7.5 μ , plerumque 7.5-9 μ longis; episporio circa 0.5 μ crasso, rubro-brunneo, subtiliter echinulato; endosporio vacuolato.

Sori in ovaries, destroying all the spikelets of an infected raceme, ellipsoid, 2-3 mm. long, evident between spreading glumes, each

enclosed by a brownish, rather thick false membrane, which ruptures from the apex to reveal a dark, semi-agglutinate, dark purple brown spore-mass surrounding a tapering columella; sterile cells of the membrane mostly subglobose to ellipsoid, $7-15.5 \times 6-13.5 \mu$, with wall about 1μ thick. Spores spherical to broadly ellipsoid, $7-12 \times 6-9 \mu$, averaging $8.7 \times 7.5 \mu$, mostly $7.5-9 \mu$ long; epispore about 0.5μ thick, medium reddish brown, finely but evidently echinulate; endospore vacuolate.

On *Andropogon schirensis* Hochst., Bandundu, Belgian Congo, Feb. 1914, H. Vanderyst 3555, type (BR 1349).

SPHACELOTHECA BARCINONENSIS Riofrio Bol. R. Soc. Esp. Hist. Nat.

23: 193. 1923.

Ustilago carbo Tul. γ *columellifera* a *transfissa* Tul. Ann. Sci. Nat. Bot. III. 7: 81. 1847.

Sphacelotheca transfissa Zundel Mycologia 31: 582. 1939.

Sori in ovaries, infecting all the spikelets in an inflorescence, narrowly ellipsoid, tapering at the apex, more or less exposed between glumes, each at first covered by a whitish, thin false membrane, rupturing irregularly later to reveal a dark, somewhat agglutinate spore mass surrounding a central, simple, slender filament of host remnant; sterile cells of the membrane hyaline, thin-walled, subglobose to ellipsoid or somewhat irregular, $7.5-18 \times 6-14 \mu$. Spores spherical to oval, mostly more or less compressed, ranging from 12 to 15μ in diameter, rarely extending to 11 or 17μ at extreme; endospore often with granular contents; epispore about 0.5μ thick, reddish brown, finely but evidently echinulate.

On *Hyparrhenia hirta* (L.) Stapf, La Calle, Algeria, May 1841, L. Motelay, type of *U. carbo* γ *columellifera* a *transfissa* (P).

On *Hyparrhenia hirta* (L.) Stapf, var. *longiaristatum* Willk., Tibidabo, Barcelona, Spain, Apr. 24, 1924, B. Fernandez Riofrio, type (BPI).

On *Hyparrhenia newtonii* (Hack.) Stapf var. *mocra* Stapf, Matonchi Farm, Mweru-Luapula District, Northern Rhodesia, Jan. 24, 1938, E. Nielne Rexhead 4316A (K).

SPHACELOTHECA CHUDAEI Har. & Pat. Bull. Soc. Myc. Fr. 26: 208. 1910.

(Fig. 1, C)

On *Vetiveria nigritana* (Hack.) Stapf, Biakh, Sahel, Mauritania, Jan. 25, 1908, R. Chudeau, type (P); Librilla, Northern Territories, Sep. 1948, C. A. Thorold (CMI 34549).

The determination of the host, which was incorrectly cited originally as *Panicum turgidum* Forsk., was verified by Melle A. Camus.

The fungus destroys the whole inflorescence of the host. After the enveloping membrane flakes away a spore-mass adhering loosely to the branched axis of the panicle remains. The spores are yellow brown and smooth, or occasionally appear faintly punctate under higher magnifications, measuring $5.5-8 \times 5.7 \mu$. They are distinguished from those of *Sphacelotheca amphiphis* Syd. only in the lack of evident echinulations.

SPHACELOTHECA MONILIFERA (Ell. & Ev.) Clint. Jour. Myc. 8: 141. 1902.

Sphacelotheca ischaemi (Fckl.) Clint. f. *heteropogonis* Bacc. Ann. di Bot. 14: 131. 1917.

On *Heteropogon contortus* (L.) Beauv., Hauasc, Galla Arussi, Ethiopia, July 8, 1909, G. Negri 1148, type of *S. ischaemi* f. *heteropogonis* (FL); Serae, Debarroa, Eritrea, Oct. 8, 1902, A. Pappi 445, sub *Ustilago cesatii* Fisch. de Waldh. (FL); Boma, Belgian Congo, July 10, 1895, A. Dewevre 122, sub *Ustilago ischaemi* Fekl. (BR).

In this species, after the upper portion of the sorus is dispersed, the lower part often remains compact and intact with spores agglutinated into balls of varying shape and size.



FIG. 1. A. *Sorosporium loudethae-superbae* on *Louderia superba*, type. B. *Sphacelotheca tristachya-hispidae* on *Tristachya hispida*, type. C. *Sphacelotheca chudael* on *Vetiveria nigritana*, type.

SPHACELOTHECA NEALII Clint. Proc. Boston Soc. Nat. Hist **31**: 389. 1904.

On *Heteropogon melanocarpus* Benth., Zomba, Nyasaland, June 11, 1949, P. O. Wiehe 260 (CMI 35743).

Sphacelotheca serrata sp. nov.

Soris in ovariis, spiculus omnes inflorescentiae inficientibus, 1 mm longis, soro quoque membrana exteriori e textura hospitis et interiori cellulis fungosis hyalinis globosis vel irregularibus, $4.5-11.5 \times 4-9.5 \mu$, tunica circa 1μ crassa composita praeditis; membrana dehiscendi et massam sporarum obscuram pulverulentem et columellam brevem detegenti; sporis interdum in glomerulis aggregatis, sphericis usque ovalibus, saepe irregularibus, $6-9.5 \times 5.5-8 \mu$; episporio circa 0.7μ crasso, rubro-brunneo, simulate glabro sed saepe minute punctato.

Sori in ovaries, infecting all the spikelets of an inflorescence, 1 mm.

long, each covered by an outer membrane of host tissue and an inner false membrane of fungus cells which are hyaline, globose or irregular, $4.5\text{--}11.5 \times 4\text{--}9.5 \mu$, with wall about 1μ thick; upon rupture of the membranes exposing a dark, dusty spore mass and a short columella. Spores occasionally aggregated into balls, spherical to oval, often somewhat irregular, $6\text{--}9.5 \times 5.5\text{--}8 \mu$; episporio about 0.7μ thick, medium reddish brown, apparently smooth but often appearing minutely punctate under higher magnifications.

On *Brachiaria serrata* Stapf, Lilongwe, Nyasaland, Sept. 1950, G. Jackson, type (CMI 44074).

***Sphacelotheca tristachyae-hispidae* sp. nov.**

(Fig. 1, B)

Soris in ovariis, spiculas omnes inflorescentiae infectae destruentibus, per glumas obvolutas protrudentibus, linearibus, $8\text{--}13$ mm longis, soro quoque membrana falsa brunneo tecto, membrana cellulis hyalinis, tenui-tunicatis catenatis, plerumque oblongis, interdum ellipsoideis $6\text{--}12 \times 4\text{--}9 \mu$ composita; massa sporarum obscura, pulverulenta, filamentis tenuibus reliquiarum hospitis immixta; sporis plerumque subangularibus, saepe subglobosis usque ellipsoideis vel ovatis, $9.7\text{--}14.5 \times 9\text{--}12 \mu$, granulosis; episporio 0.5μ crasso, olivaceo-brunneo, simulate glabro sed tenuiter foveolato.

Sori in ovaries, destroying all the spikelets of an infected inflorescence, protruding through the enveloping glumes, linear, $8\text{--}13$ mm. long, each enclosed by a brown false membrane composed of hyaline, thin-walled sterile cells in chains, mostly oblong, occasionally ellipsoid, $6\text{--}12 \times 4\text{--}9 \mu$. Spore-mass dark, dusty, intermixed with several slender filaments of host remnant. Spores mostly subangular, often subglobose to ellipsoid or ovate, $9.7\text{--}14.5 \times 9\text{--}12 \mu$, contents granular; episporio 0.5μ thick, medium to deep olive brown, apparently smooth, but appearing finely pitted under high magnifications.

On *Tristachya hispida* K. Schum., Lilongwe, Nyasaland, Feb. 1951, G. Jackson, type (CMI 41508).

***Sorosporium anthephorae* sp. nov.**

(Fig. 2, C)

Soris in ovariis, spiculas omnes racemi inficientibus, fusiformi-ellipsoideis, $3.5\text{--}7$ mm longis, $0.5\text{--}1$ mm in diam., soro quoque membrana lenta pallide brunneola fungosa tecto, membrana demum in fragmentis longis decidenti et massam sporarum obscuram columellam centralem, simplicem, tenuem circumdantem detegenti; glomerulis sporarum in maturitate evanescentibus, opacis, subglobosis usque ovalibus, oblongis vel irregularibus, $42\text{--}98 \times 35\text{--}65.5 \mu$; sporis sphericis usque late ellipsoideis, saepe subangularibus, $7.5\text{--}11 \times 7\text{--}9 \mu$; episporio 1μ vel minus crasso, valde rubro-brunneo, tenuiter sed dense echinulato.

Sori in ovaries, infecting all the spikelets in a cluster, fusiform-ellipsoid, $3.5\text{--}7$ mm. long, $0.5\text{--}1$ mm. diam., each enclosed by a light brown, rather tough membrane of fungus tissue, which later lacerates into long shreds revealing a dusty, dark spore-mass surrounding a central, simple, slender columella. Spore-balls evanescent at maturity, opaque, subglobose to oval, oblong or irregular, $42\text{--}98 \times 35\text{--}67.5 \mu$.

Spores spherical to broadly ellipsoid, frequently slightly angular, $7.5-11 \times 7-9 \mu$; episore 1μ or less thick, deep reddish brown, finely but densely echinulate.

On *Antheophora acuminata* Robyns, Central Province, Mzmba District, Nyasaland, Sep. 29, 1950, G. Jackson, type (CMI 44451).

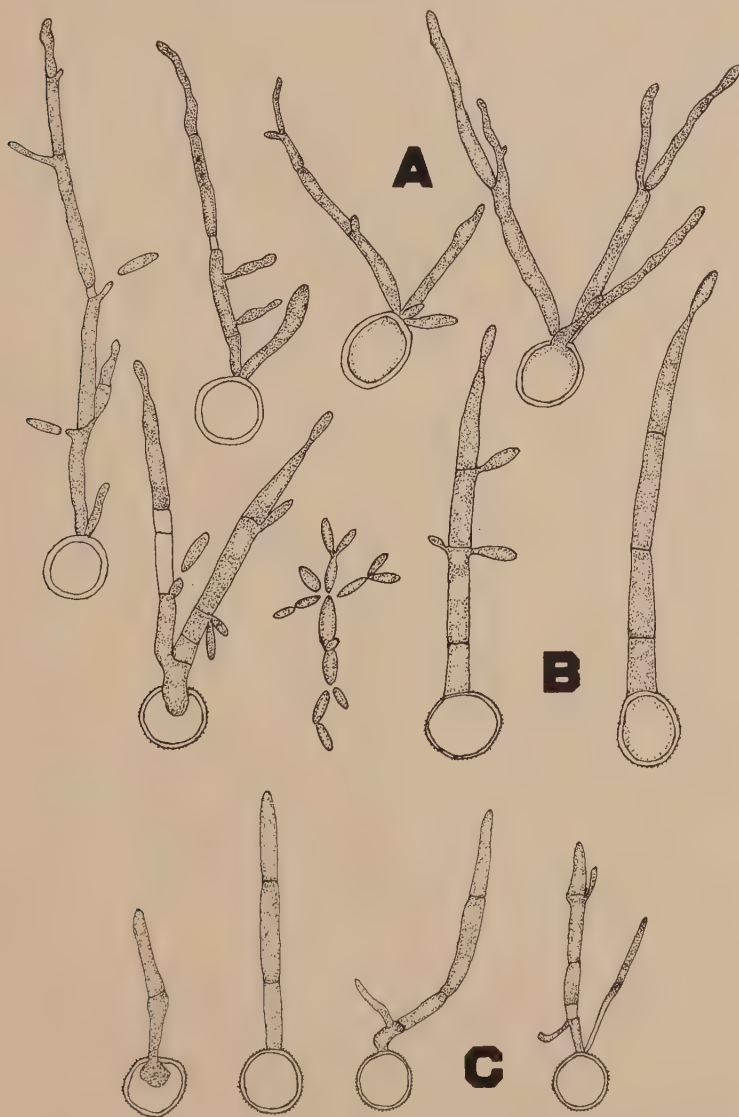


FIG. 2, A-C. Germination of spores. A. *Sorosporium loudetiae-superbae*. B. *Sorosporium bothriochloae*. C. *Sorosporium ischaemoides*, on *Hyparrhenia dissoluta*.

SOROSPORIUM ANTHISTIRIAE (Cobb) Ling Imp. Myc. Inst. Myc. Papers 11: 9. 1945.

Tolyposporium anthistiriae Cobb Agr. Gaz. N. S. Wales 3: 1006. 1892.

Sorosporium holstii P. Henn. in Engler, Pflanzenw. Ost.-Afr. Nachb. C: 49. 1895.

Tolyposporium anthistiriae P. Henn. Hedwigia 37: 283. 1898.

On *Themeda quadrivalvis* (L.) Kuntze, Mt. Parramatta, Victoria, Australia, Nov. 28, 1910, sub *Tolyposporium bursum* McAlp.; Inman Valley, South Australia, Jan. 1922, J. B. Cleland, sub *T. bursum*.

On *Themeda triandra* Forsk., Djur, Central Africa, G. Schweinfurth 2439, type of *T. anthistiriae* P. Henn. (CH); Madeira, U. S. South Pacific Exploring Expedition, 1838-1842 (US 926406); Northern Province, Nyasaland, Sep. 30, 1950, P. O. Wiehe 920 (CMI 44455).

On *Themeda triandra* Forsk. var. *hispidula* Stapf, Usambara, Tanganyika Territory, 1893, C. Holst 3111a, type of *S. holstii* (K, BPI).

***Sorosporium bothriochloae* sp. nov.**

(Fig. 2, B)

Soris in ovariis, cylindricis, apicem versus attenuatis, 5-13 mm longis, 1.5 mm latis, supra glumas protrudentibus, soro quoque membrana falsa flavidula tecto, membrana ex apice decidenti et massam sporarum obscuram filamenta 1-2 hospitis circumdantem detegenti; glomerulis sporarum semi-opacis, persistentibus vel facile separantibus, polygonalibus, oblongis vel ovalibus, 75-200 x 60-170 μ ; sporis plerumque globosis ovalibusve, interdum ovoideis vel subangularibus, 10.5-15 x 9.5-13.5 μ , episporio circa 0.7 μ crasso; exterioribus olivaceo-brunneis, tenuiter sed dense echinulatis, interioribus pallide olivaceo-brunneis, glabris vel paene glabris, endosporio globula distincta, centrali granulosa et tunica 0.5 μ crassa praedito.

Sori in ovaries, cylindrical, tapering at the apex, 5-13 mm. long and 1.5 mm. wide, protruding beyond the glumes, each covered by a yellowish, rather tough false membrane which dehisces from apex exposing a granular, dark spore-mass surrounding 1 or 2 filaments of host remnants. Spore-balls semi-opaque, rather permanent but readily separable, polygonal, oblong or oval, 75-200 x 60-170 μ . Spores chiefly globose to oval, occasionally ovoid or slightly angular, 10.5-15 x 9.5-13.5 μ , episporium about 0.7 μ thick; outer spores olivaceous brown, very finely but densely and evidently echinulate; inner ones light olivaceous brown, smooth or nearly smooth, endospore with a distinct, granular, central globule and a thick wall 1.5 μ thick.

On *Bothriochloa glabra* (Roxb.) A. Camus, Kalembo, Nyasaland, Apr. 2, 1949, P. O. Wiehe 142, type (CMI 35066).

SOROSPORIUM CALEDONICUM Pat. Bull. Soc. Myc. Fr. 3: 173. 1887

Sorosporium heteropogonis-contorti Bacc. Ann. di Bot. 14: 132. 1917.

On *Heteropogon contortus* (L.) Beauv., Hauasc, Arussa, Ethiopia, July 8, 1909, G. Negri 1140, type of *S. heteropogonis-contorti* (FL).

***Sorosporium congoense* sp. nov.**

Soris in ovariis supra glumas involventes protrudentibus, cylindricis, 7-18 mm longis, circa 1.5 mm in diam., soro quoque membrana falsa griseo-brunnea tecto, membrana demum ex apice fissenti et massam sporarum pulverulentem, obscuram filamentis pluribus tenuibus hospitis

immixtam detegenti; glomerulis sporarum evanescentibus, subglobois, ellipsoideis oblongis vel irregularibus, $45-120 \times 37-90 \mu$; sporis globosis usque ovalibus, saepe ellipsoideis vel subirregularibus, plerumque $7.5-10.5 \mu$ in diam., longissimis interdum usque 12μ attingentibus, rubro-brunneis, verruculosi; endosporio globula centrali praedito; sporis periphericis colore intensioribus, saepe subangularibus et plus conspicue verruculosi.

Sori in ovaries, protruding beyond the enveloping glumes, cylindrical, 7-18 mm. long, about 1.5 mm. diam., each enclosed by a grayish brown false membrane which dehisces later from the apex disclosing a pulverulent, dark spore-mass intermixed with several fine filaments of remnant host tissue. Spore-balls evanescent, subglobose, ellipsoid, oblong or irregular, $45-120 \times 37-90 \mu$. Spores globose to oval, or often ellipsoid or slightly irregular, chiefly $7.5-10.5 \mu$ diam., elongate ones occasionally attaining 12μ long, medium reddish brown, verruculose, endospore with a central globule; those situated at the peripheral part of a spore-ball deeper in color, often subangular, with more prominent verruculations.

On *Andropogon gabonensis* Stapf, N. Dembo, Belgian Congo, June 1906, H. Vanderyst B32, type (BR 339); N. Dembo, Belgian Congo, June 23, 1908, H. Vanderyst, sub *Sorosporium wildemanianum* P. Henn. (BR 275); Kinshasa, Belgian Congo, June 4 1906, H. Vanderyst, sub *Sorosporium everhartii* Ell. & Gall. (BR 1326).

The type of this species was cited by Hennings (3) as one of the cotypes of *Ustilago vanderysti* P. Henn., with which it has very little in common. It can be distinguished from *Sorosporium ischaemoides* (P. Henn.) Zundel by its evanescent spore-balls which are not differentiated into an outer layer of reddish brown, verruculate spores and an inner mass of subhyaline smooth spores.

***Sorosporium decorsei* (Har. & Pat.) comb. nov.**

Tolyposporium decorsei Har. & Pat. Bull. Mus. Nat. Hist. Natur. Paris 15: 197. 1909.

Sori in ovaries, cylindrical, 8-10 mm. long, 1.5 mm. wide, partially hidden by the glumes, each covered by a pale brownish false membrane which decomposes later exposing a dark, granular spore-mass surrounding 2-3 filaments of host tissue. Spore-balls opaque, mostly irregular in shape, occasionally subglobose to oblong, consisting of 9-33 spores, $37.5-67.5 \times 30-38 \mu$. Spores globose to oval, or somewhat angular, $9.5-12.7 \times 8-10 \mu$, deep reddish brown, densely verruculose, epispore 1.5μ thick; a few spores in the interior of each spore-ball hyaline and smooth.

On *Loudetia* sp., pays Ndonka et Kouti, Haut-Chari, French Equatorial Africa, May 1903, A. J. Decorse 8276, type (P).

SOROSPORIUM DEMBIANENSE Bacc. Ann. di Bot. 14: 132. 1917.

Sori in ovaries, destroying all the spikelets in an infected inflorescence, linear, ordinarily 4-6 mm. long, but attaining 1.5 cm. on *Hyparrhenia arrhenobasis*, 0.5-0.8 mm. wide, partially concealed by glumes, each enclosed at first by a light brown, thin false membrane which ruptures later at the apex revealing a single, slender thread of host remnant surrounded by a dark spore mass. Spore-balls sub-

opaque, subglobose to ellipsoidal, or often irregular, rather permanent, chiefly $25-60 \times 21-45 \mu$. Spores in the outer part of a spore-ball mostly subangular, elongate-ellipsoid or oval in outline, occasionally globose to subglobose, medium reddish brown, chiefly $9-13.5 \times 8-12 \mu$, elongate ones rarely up to 15μ in length, episore 1μ or less thick, distinctly verruculose on the free surface; inner spores hyaline to pale olivaceous, smooth, occasionally indistinctly verruculate, globose to oval, frequently subangular, $8-11.5 \times 7.5-9.7 \mu$, rather few in each spore-ball.

On *Hyparrhenia arrhenobasis* (Hochst.) Stapf, Gondar, Dembia, Amhara, Ethiopia, Oct. 2, 1909, E. Chiovenda 2281 (FL).

On *Hyparrhenia hirta* (L.) Stapf, Ngosingos, Ukena, Tanganyika Territory, May 1899, W. Goetze, sub *Sorosporium holstii* P. Henn. (CH, S).

On *Hyparrhenia rufa* (Nees) Stapf, Asoso, Dembia, Amhara, Ethiopia, Oct. 27, 1909, E. Chiovenda 2671, lectotype (FL); Gondar, Ethiopia, Oct. 9, 1909, E. Chiovenda 2427 (FL); Asoso, Ethiopia, Sept. 10, 1909, E. Chiovenda 2054 (FL); Zomba, Nyasaland, April 4, 1950, P. O. Wiehe 635 (CMI 40988).

Baccarini (1) cited four collections made by Chiovenda in Ethiopia in his original description of this species, without specifying the type. One of them, No. 2671, is herein selected and proposed as the lectotype, for it represents the more common form. The other three collections deviate from it in having spores lighter coloured in No. 2054, slightly larger in No. 2427, and less distinctly verruculate in No. 2281.

The measurements of spore-balls and spores of all the collections cited above are as follows:

Collector	Size of spore-balls	Size of spores
Chiovenda 2671	$26-52.5 \times 21.5-41 \mu$	$9-13.5 \times 8-11.5 \mu$
Chiovenda 2054	$23-46.5 \times 16.5-43.5 \mu$	$9-12.5 \times 7.5-10.5 \mu$
Chiovenda 2427	$30-58.5 \times 21-45 \mu$	$9.5-15 \times 9-12 \mu$
Chiovenda 2281	$25-48 \times 18-40.5 \mu$	$9-13.5 \times 7.5-11.5 \mu$
Goetze	$30-70 \times 22-38 \mu$	$9-12.5 \times 7.5-10.5 \mu$
Wiehe	$22-50 \times 22-38 \mu$	$9-13 \times 8-11 \mu$

This species is very closely related to *Sorosporium pollinae* Magn. on *Andropogon distachys* L. which, however, has deep reddish brown and mostly polyhedral spores.

The collection of Goetze cited above was incorrectly reported by Hennings (4) as *Sorosporium holstii* P. Henn.

Sorosporium densiflorum sp. nov.

Soris in inflorescentiis, quoque plus quam parum unum racemi involventi, vaginis stricte circumdantibus omnino tectis, filiformibus, 1.5-2 cm. longis, minus quam 1 mm in diam., membrana tenui, albidia ex apice fissenti, disseminationem sporarum permittenti et filamenta tenuia hospitis 2-7 detegenti; glomerulis sporarum opacis, persistentibus vel facile separantibus, angularibus, oblongis vel interdum subglobosis usque ellipsoideis, $67-135 \times 45-105 \mu$; sporis rubro-brunneis, globosis vel ovalibus, plerumque subangularibus, $10-13.5 \times 9-12 \mu$, longissimis rare usque 15μ attingentibus; episporio glabro sed superficie libera sparse punctato; endosporio globula centrali et tunica $1.5-2 \mu$ crassa praedito.

Sori in the inflorescence, each involving more than one pair of racemes, entirely hidden by the tightly enveloping leaf-sheaths, filiform, 1.5–2 cm. long, less than 1 mm. diam., enclosed by a thin, whitish false membrane which decomposes at maturity from the apex to permit the dissemination of spores and to expose the 2–7 slender threads of host remnants. Spore-balls opaque, rather permanent but easily separable, angular, oblong, or occasionally subglobose to ellipsoid, 67–135 x 45–105 μ . Spores deep to dark reddish brown, globose to oval, mostly somewhat angular, 10–13.5 x 9–12 μ , the most elongate ones rarely attaining 15 μ in length; epispore smooth except on free surface which appears under higher magnifications sparsely but evidently punctate; endospore with a central globule and a wall 1.5–2 μ thick.

On *Cymbopogon densiflorus* (Steud.) Stapf, Leverville, Belgian Congo, Dec. 6, 1918, H. Vanderyst, type (BR 1329).

This species is morphologically near to *Sorosporium spermoideum* (Berk. & Br.) Ling, occurring on the same host genus. In the latter, however, there is a clear differentiation in color between spores at the periphery and in the interior of a spore-ball and the spores are smaller and lighter colored than those of the present species.

***Sorosporium dubiosum* (Zundel) comb. nov.**

Cintractia dubiosa Zundel Mycologia 23: 299. 1931.

Sori in ovaries, destroying all the spikelets of an infected panicle, subglobose or oval, 1.5–2 mm. long., usually hidden by enveloping glumes, compact, very firmly agglutinated. Spore-balls rather persistent, mostly globose to oval, occasionally irregular, 24–57 x 21–37.5 μ . Spores globose to oval, or subangular, 7.5–10.5 x 6.7–9.5 μ , deep reddish brown, verruculose under higher magnifications; inner spores often slightly lighter in color, smooth or indistinctly sculptured; endospore with a central globule.

On *Pennisetum ciliare* Link, near Great Karasberg, Transvaal, South Africa, Dec. 1912–Jan. 1913, H. H. W. Pearson, sub *Sorosporium cenchri* Zundel (PRM 8893).

On *Pennisetum* sp., Nairobi, Kenya, Sep. 9, 1920, H. L. Shantz, type (BPI).

Zundel (7) assigned the South African collection cited above to *Tolyposporium cenchri* Bref., transferring it to the genus *Sorosporium*. Although Brefeld's species is a member of *Sorosporium*, it destroys the whole inflorescence of *Cenchrus echinatus* L. instead of individual ovaries and also differs from the African collections cited here in spore characters.

***Sorosporium goniosporum* (Mass.) comb. nov.**

Ustilago goniospora Mass. Kew Bull. 1899: 183. 1899.

Sori in ovaries, inconspicuous, 3–4 mm. long, fusiform-ellipsoid, less than 1 mm. wide, hidden by the enveloping glumes, each enclosed by a thin false membrane. Spore-balls mostly subglobose or oval, occasionally irregular, dark, easily separable, 45–75 x 40–60 μ . Spores dark reddish brown and subopaque at the outer part of the ball, medium to deep reddish brown at the inner part, chiefly polyhedral, occasionally spherical to oval, 11.5–16.5 x 9–14 μ , obscurely but densely verruculose, epispore 1 μ or less thick.

On *Aristida adonis* Hochst, Ukamba, Kenya, Scott-Elliot 6491, type (K).

***Sorosporium guaranticum* (Speg.) comb. nov.**

Ustilago guarantica Speg. Anal. Soc. Cient. Argent. **17**: 87. 1884.

Sphacelotheca guarantica Zundel Mycologia **22**: 135. 1930.

Sori in the inflorescence, each involving a single raceme, filiform, 1–2 cm. long, rather tightly enclosed by the spathe with tip protruding at maturity, covered by a yellowish, thin false membrane that dehisces into shreds disclosing a black, granular spore-mass surrounding a slender, twisted filament of host origin; infected branches becoming densely aggregated into a witches' broom-like growth. Spore-balls rather persistent but readily breakable, opaque, subglobose, oval, oblong or irregular, 52.5–127.5 x 45–75 μ . Spores at the periphery of the ball dark reddish brown, subspherical to broadly ellipsoid or elongate, mostly somewhat irregular, 12–19.5 x 11–15.5 μ , obscurely verruculate, epispore very thin and brittle, becoming cracked under slight pressure, endospore with a wall 1.5–2.5 μ thick; inner spores light to medium reddish brown, smooth, otherwise similar to the peripheral ones.

On *Schizachyrium condensatum* (H. B. K.) Desv., Paraguari, Paraguay, Apr. 1883, B. Balansa 3739, type (LP 3050); Caracas, Venezuela, Dec. 28, 1938, A. S. Muller 2325 (BPI).

This species appears to be often misinterpreted in literature. The Brazilian specimen issued by Rabenhorst, Winter and Pazschke as *Fungi europaei et extraeuropaei* no. 4006, on which Zundel's (6) description of this species was based, is *Sphacelotheca macrothrixii* Zundel. Hennings (2) assigned to this species a collection from Argentina which is *Sorosporium consanguineum* Ell. & Ev. on *Aristida*.

Hirschhorn (5) stated that spore-balls were found in this species, but considered them as accidental adherence of spores which is obviously not the case.

SOROSPORIUM ISCHAEMOIDES (P. Henn.) Zundel Mycologia **29**: 587. 1937.

(Fig. 2, A)

On *Hyparrhenia diplandra* (Hack.) Stapf, Thysville, Belgian Congo, July 1914, H. Vanderyst 4437, sub *Sorosporium everhartii* Ell. & Gall. (BR 1292); Kinshasa, Belgian Congo, June 1916, H. Vanderyst 19, sub *S. everhartii* (BR 1339).

On *Hyparrhenia dissoluta* (Nees) Hubb., Zomba, Nyasaland, June 11, 1949, P. O. Wiehe 261 (CMI 35742).

On *Hyparrhenia dissoluta* the sori of this fungi extend to 1 to 3.5 cm. in length and 1.5–2 mm. in diameter, which are much larger than those on other hosts observed.

***Sorosporium loudetiae-superbae* sp. nov.**

(Fig. 1, A)

Soris in ovariis, spiculas omnes inflorescentiae infectae destruentibus, partim per glumas involventes protrudentibus, cylindricis, 12–16 mm longis, 2 mm latis, soro quoque membrana falsa griseola tecta, membrana tardius irregulariter fissenti et massam sporarum atram filamentis

tenuibus hospitis 3-5 intermixtam detegenti; glomerulis sporarum plerumque irregularibus, interdum subglobosis usque oblongis, evanescentibus, opacis, 60-83 x 52.5-75 μ ; sporis plerumque polyedricis, plus minusve elongatis, 12-19.5 x 10.5-16.5 μ , longissimis rare usque 22.5 μ attingentibus, interdum subglobosis usque ovalibus, 11-15 μ in diam.; episporio circa 1 μ crasso, olivaceo-brunneo, in superficie libera conspicue verrucoso, interioribus glabris, pallidioribus.

Sori in ovaries, destroying all the spikelets of an infected inflorescence, partially protruding through the enveloping glumes, cylindrical, 12-16 mm. long, 2 mm. wide, each enclosed by a grayish false membrane which dehisces irregularly later, exposing a black spore-mass intermixed with 3-5 slender filaments of host remnants. Spore-balls mostly irregular, occasionally subglobose to oblong, evanescent, opaque, 60-83 x 52.5-75 μ . Spores chiefly polyhedral and more or less elongate, 12-19.5 x 10.5-16.5 μ , the most elongate ones rarely attaining 22.5 μ in length, occasionally subglobose to oval, 11-15 μ diam.; episporium approximately 1 μ thick, deep olivaceous brown, prominently verrucose on the free surface; spores in the inner part of the ball smooth, slightly lighter in color.

On *Loudetia superba* De Not., Kasupi, Nyasaland, June 16, 1949, P. O. Wiehe 277, type (CMI 35741).

On the three related genera of Arundinelleae, i.e. *Loudetia*, *Trichopteryx* and *Tristachya*, occur six species of smuts. Among these, *Sorosporium loudetiae-superbae*, *S. decorsei* and *Sphacelotheca tristachyae-hispidae* are described in the present note. The following key serves to distinguish all of the six species.

Spores not in balls

Spores apparently smooth, 9.7-14.5 μ long. *Sphacelotheca tristachyae-hispidae*

Spores verrucose, 4-6 μ long. *Ustilago trichopterygis* Mass.

Spores formed in balls

Sori filiform, 3-6.5 cm. long. *Sorosporium loudetiae* Viennot-Bourgin

Sori fusiform-ellipsoid or cylindrical, less than 2 cm. long

Spores prominently verrucose on free surface,

Sorosporium loudetiae-superbae

Spores indistinctly verruculose on free surface

Spores 9.5-12.7 μ long. *Sorosporium decorsei*

Spores 10.5-17 μ long. *Sorosporium tristachydis* Syd.

SOROSPORIUM OVARII Griff. Bull. Torrey Club **34**: 209. 1907.

Sphacelotheca diplospora (Ell. & Ev.) Clint. var. *verruculosa* Clint. N. Amer. Fl. **7**: 27. 1906.

Sorosporium brachiariae Hopkins Trans. Rhodesia Sci. Assoc. **35**: 126. 1938.

On *Brachiaria brizantha* Stapf, Salisbury, Southern Rhodesia, Jan. 26, 1932, J. C. F. Hopkins, type of *S. brachiariae* (BPI).

On *Brachiaria meziana* Hitchc., Lecheria, Mexico, July 1904, C. G. Pringle, type of *S. diplospora* var. *verruculosa* (CH); Dublan, Hildago, Mexico, Sep. 4, 1905, D. Griffiths, sub *Sorosporium erichloae* Griff.

On *Brachiaria reptans* (L.) Gard. & Hubb. (= *Panicum caespitosum* Swartz), Dublan, Hildago, Mexico, Sep. 9, 1905, D. Griffiths, type (BPI).

There is no appreciable difference among the above collections, except that the spore-balls of the fungus on *Brachiaria meziana* are less persistent than those on other hosts. Spore-balls measure 45-127.5 x

37.5–97.5 μ . Spores are reddish brown and minutely echinulate, ranging from 9 to 12 μ in diameter which occasionally extends to 8 or 13.5 μ at extreme.

SOROSPORIUM PASPALI-THUNBERGII (P. Henn.) S. Ito Trans. Sapporo Nat. Hist. Soc. **14**: 94. 1935.

On *Paspalum commersonii* (Stapf) Hubb., Dolo, Belgian Congo, May 31, 1916, H. Vanderyst 11, sub *Sorosporium everhartii* Ell. & Gall. (BR 1324).

***Sorosporium pappianum* (Bacc.) comb. nov.**

Ustilago pappiana Bacc. Ann. di Bot. **4**: 272. 1906.

Sori in ovaries, destroying all the spikelets in an infected inflorescence, 3–5 mm. long, partially protruding through the enveloping glumes, each at first enclosed by an outer membrane of host origin and an inner false membrane of fungus tissue, which rupture irregularly later revealing a dark, somewhat agglutinate spore-mass surrounding a short central columella; sterile cells of the false membrane mostly oblong, occasionally subglobose to oval, hyaline, 6–12 x 5–7.5 μ . Spore-balls rather evanescent and at later stages found only at the base of the sorus, opaque, subglobose to ellipsoid, oblong or angular, 38–100 μ long. Spores globose to oval, occasionally oblong or angular, chiefly 7.5–12.5 x 7–11 μ , epispore medium reddish brown, densely verruculose, approximately 1 μ thick; immature spores, which are often found in young spore-balls still surrounded by mycelial threads, much smaller, lighter colored, and less evidently verruculate.

On *Pennisetum orientale* Rich (= *P. ruppellii* Steud.), Addi-Baro, Amasen, Eritrea, Oct. 29, 1902, A. Pappi 6168, lectotype (FL); Ingal-Ceccaharat, Achele Cusai, Eritrea, Mar. 22, 1893, A. Pappi 4797 (FL).

SOROSPORIUM VERECUNDUM (Syd.) Zundel *Bothalia* **3**: 304. 1938.

Ustilago verecunda Syd. Ann. Myc. **33**: 231. 1935.

Ustilago urochloana Zundel *Mycologia* **35**: 166. 1943.

On *Urochloa helopus* Stapf, Wonderboom, Pretoria, South Africa, Feb. 27, 1931, A. O. D. Mogg, type (PRM 26609).

On *Urochloa trichopus* Stapf, Crocodile River, Transvaal, South Africa, June 8, 1921, A. O. D. Mogg, type of *U. urochloana* (PRM 20690).

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A Revision of the Ecuadorean Species of *Monnina* (Polygalaceae)

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The genus *Monnina* (Polygalaceae) has been studied by the writer as it occurs in northwestern South America, and discussions of the species growing in each country have been prepared.¹ In the present revision, 32 species are recognized from Ecuador, indicating that this country, like Peru and Colombia, is important as a distributional center in the genus.

The present paper is the result of work undertaken at the U. S. National Museum, Smithsonian Institution, during the writer's tenure as a Fellow of the John Simon Guggenheim Memorial Foundation. To the authorities of that Foundation and the Smithsonian Institution the author is deeply grateful for the support and facilities offered. All the available herbarium specimens of Ecuadorean species of *Monnina* of the following institutions have been examined, and they are cited in this paper as indicated: Chicago Natural History Museum (Ch); U. S. Department of Agriculture, National Arboretum (DA);² Gray Herbarium of Harvard University (GH); Royal Botanic Gardens, Kew (K); New York Botanical Garden (NY); and U. S. National Herbarium (US). To the directors and curators of these institutions the writer is grateful for the many courtesies extended. Types or photographs of types of most species have been examined, and the flowers of 30 species are illustrated in this treatment.

KEY TO THE SPECIES

Plants annual, small; fruit a samara.

Leaves lanceolate or elliptic; branches canescent-strigose; ovary completely pubescent; style without auricles; fruit slightly winged, cordiform, strongly canescent-pubescent.....1. *M. herbacea*

Leaves linear; branches glabrescent; ovary glabrous; style with 2 auricles; fruit ellipsoid, conspicuously winged, strigose.....2. *M. spruceana*

Plants perennial, frutescent, sometimes scandent; fruit a drupe.

Inflorescence paniculate.

Lower sepals $\frac{2}{3}$ or $\frac{1}{2}$ united, rarely only inconspicuously united at base.

Branches densely hirsute; flower-subtending bracts more or less lanceolate, hood-shaped at base, up to 7.5 mm. long; lower sepals slightly united at base.....3. *M. cuspidata*

Branches usually glabrescent, rarely hirsute; flower-subtending bracts linear, up to 4.8 mm. long; lower sepals $\frac{2}{3}$ or $\frac{1}{2}$ united.

Erect shrub; outer sepals conspicuously obtuse.

¹The Peruvian species were discussed in "A revision of the Peruvian species of *Monnina*," in Journ. Arn. Arb. 27: 123-167, pl. 1-10. 1946, and the Colombian species in "A revision of the Colombian species of *Monnina*," in Smiths. Misc. Coll. 121 (3): 1-59, Fig. 1-59. 1953. The species occurring in Venezuela are taken up in a paper now in press.

²Specimens cited (DA) have been transferred from the Herbarium of the National Arboretum, U. S. Department of Agriculture, to the U. S. National Herbarium since this paper was written.

- Leaves elliptic (up to 115 x 55 mm.), coriaceous, acute, mucronate; flower-subtending bracts up to 2.2 mm. long; pedicels up to 1.2 mm. long; lower sepals $\frac{1}{2}$ united; drupe acuminate at apex.....4. *M. subspeciosa*
- Leaves lanceolate (up to 187 x 68 mm.), herbaceous, acuminate, not mucronate; flower-subtending bracts up to 4.8 mm. long; pedicels up to 0.5 mm. long; lower sepals $\frac{2}{3}$ united, drupe obtuse at apex.....5. *M. trichoptera*
- Scandent plants; outer sepals acute.
- Branches conspicuously hirsute, striate; leaves pubescent, with 10-12 pairs of lateral veins; flower-subtending bracts triangular (up to 2.8 x 1.4 mm.); wings and keel glabrous.....6. *M. media*
- Branches glabrescent, terete; leaves glabrescent, with 7 or 8 pairs of lateral veins; flower-subtending bracts linear (up to 3.5 x 1.2 mm.); wings and keel pubescent.....7. *M. subscandens*
- Lower sepals completely free.
- Leaves spatulate; branches more or less glabrescent; lateral branches of panicle up to 40 cm. long.....8. *M. sodiroana*
- Leaves elliptic or lanceolate; branches conspicuously hirsute, rarely glabrescent; lateral branches of panicle up to 22 cm. long.
- Leaf-blades narrowly lanceolate, acuminate, about 4 times as long as wide (up to 110 x 27 mm.); flower-subtending bracts linear; outer sepals lanceolate; lower sepals acuminate.....9. *M. pseudo-pilosa*
- Leaf-blades elliptic, acute, less than 2.5 times as long as wide (up to 175 x 72 mm.); flower-subtending bracts ovate-triangular; outer sepals triangular; lower sepals obtuse or acute, 3-nerved.
- Lateral branches of panicle with conspicuous flower-subtending bracts up to 7 mm. long.
- Upper branches densely hirsute; leaves hirsute, with about 10 pairs of lateral veins.....10. *M. pilosa*
- Upper branches glabrescent; leaves glabrous, with about 6 pairs of lateral veins.....11. *M. pilgeri*
- Lateral branches of panicle with inconspicuous flower-subtending bracts up to 3 mm. long.
- Habit hirsute; leaves acute or obtuse; panicle with crowded lateral branches, the axis up to 28 cm. long; flower-subtending bracts triangular, up to 2 mm. long; keel glabrous within; ovary ovoid.....12. *M. paniculata*
- Habit strigose, glabrescent; leaves acuminate; panicle with a few lateral branches, the axis up to 12 cm. long; flower-subtending bracts lanceolate-linear, up to 3 mm. long; keel pubescent within; ovary more or less cylindric, slightly curved.....13. *M. denticulata*
- Inflorescence simply racemose.
- Lower sepals completely free.
- Leaves linear-elliptic, conspicuously revolute, 1-nerved, decurrent, crowded.....14. *M. revoluta*
- Leaves ovate or elliptic, rarely lanceolate, not revolute or rarely more or less revolute, with several pairs of lateral veins, not decurrent or crowded.
- Herbaceous; flower-subtending bracts conspicuous, linear; style auricled, strongly thickened toward apex.....15. *M. pterocarpa*
- Fruticose; flower-subtending bracts inconspicuous, triangular; style without auricles, more or less cylindric.
- Ovary completely or at least partially pubescent.
- Branches conspicuously hirsute; leaves lanceolate or ovate-lanceolate, acute.
- Leaves narrowly lanceolate, not mucronate (up to 70 x 21 mm.); flower-subtending bracts triangular, inconspicuous; ovary densely pubescent; drupe up to 4.5 mm. long.....16. *M. andreana*
- Leaves ovate-lanceolate, mucronate (up to 115 x 45 mm.); flower-subtending bracts linear, conspicuous (up to 2 mm. long); ovary slightly pubescent or glabrescent; drupe up to 7 mm. long.....17. *M. chimborazoana*

- Branches strigose or glabrescent; leaves elliptic, obtuse.
 Leaves revolute; wings conspicuously pubescent above and beneath; style pubescent. 18. *M. decurrens*
 Leaves not revolute; wings glabrous; style glabrous. 19. *M. loxensis*
- Ovary completely glabrous.
 Branches obviously corymbose; leaves obovate, emarginate, revolute. 20. *M. obovata*
 Branches not corymbose; leaves elliptic or lanceolate, not emarginate, rarely slightly revolute.
 Upper branches hirsute; leaves narrowly lanceolate, acuminate, with 8 or 9 pairs of lateral veins; flower-subtending bracts linear, up to 5 mm. long. 21. *M. angustata*
 Upper branches glabrescent; leaves elliptic, obtuse, with 5 or 6 pairs of lateral veins; flower-subtending bracts acute-triangular, up to 2.2 mm. long. 22. *M. salicifolia*
- Lower sepals conspicuously joined, usually $\frac{1}{2}$ united, sometimes more or less united at base, rarely $\frac{2}{3}$ united.
 Leaves linear, 1-nerved; lower sepals $\frac{2}{3}$ united. 23. *M. crassifolia*
 Leaves elliptic or lanceolate, with several pairs of lateral veins; lower sepals $\frac{1}{2}$ united or only slightly united at base.
 Ovary completely pubescent; leaves conspicuously revolute; wings strongly pubescent beneath.
 Branches hirsute; leaves canescent-hirsute (up to 135 x 31 mm.); upper sepal involute at apex; keel pubescent within. 24. *M. equatoriensis*
 Branches not hirsute, obviously viscid; leaves glabrescent (up to 30 x 14 mm.); upper sepal not involute at apex; keel glabrous within. 25. *M. myrtilloides*
- Ovary completely glabrous; leaves not revolute; wings glabrous beneath.
 Leaves herbaceous, acuminate; wings acute at base. 26. *M. rupestris*
 Leaves more or less coriaceous, obtuse or acute; wings obtuse at base.
 Leaf-blades acuminate, mucronate; racemes acuminate at apex, up to 18 mm. wide; flower-subtending bracts linear (up to 2.8 x 0.8 mm.); upper sepal up to 4.2 mm. long. 27. *M. haughtii*
 Leaf-blades obtuse, rarely acute, not mucronate; racemes acute at apex, up to 10 mm. wide; flower-subtending bracts triangular (up to 2.2 x 1.6 mm.); upper sepal up to 2.6 mm. long.
 Leaves narrowly lanceolate, about 5 times as long as wide (up to 130 x 24 mm.), with 10-12 pairs of lateral veins; lower sepals 1-nerved. 28. *M. lingua*
 Leaves elliptic or broadly lanceolate, about 2.7 times as long as wide (up to 95 x 35 mm.), with 7 or 8 pairs of lateral veins, rarely with inconspicuous lateral veins; lower sepals 3- or 5-nerved.
 Branches hirsute; leaves acute, hirsute; lower sepals slightly united at base. 29. *M. phytolaccifolia*
 Branches glabrescent; leaves obtuse, glabrescent; lower sepals $\frac{1}{2}$ united, rarely $\frac{2}{3}$ united.
 Style pubescent; lower sepals 5-nerved; keel densely pubescent within. 30. *M. obtusifolia*
 Style glabrous; lower sepals 3-nerved; keel glabrous within, sometimes with a few hairs.
 Upper branches hirsute; leaves glabrous; outer sepals glabrous beneath, the two lower ones $\frac{2}{3}$ united; style strongly thickened toward apex, the upper lobe conspicuously elongate. 31. *M. pseudo-aestuans*
 Upper branches strigose or glabrescent; leaves strigose; outer sepals pubescent beneath, the two lower ones $\frac{1}{3}$ or $\frac{1}{2}$ united; style only slightly thickened toward apex, the upper lobe short, not elongate. 32. *M. aestuans*

1. MONNINA HERBACEA DC. Prod. 1: 340. 1824.

Monnina leptostachya Benth. Pl. Hartw. 125. 1844.

Annual, 2.6–4.3 dm. high; root 3.5–5.5 cm. long, 1.5–2 mm. in diameter, curved, usually branched; stem erect, striate, branched at base, the branches 12–29 cm. long, more or less corymbose, canescent-strigose; leaves usually lanceolate, rarely almost elliptic, 13–42 mm. long, 5–14 mm. wide, obtuse, slightly pubescent, becoming glabrescent, entire, attenuate at base, the costa prominulous beneath, with 5 or 6 pairs of lateral veins; petioles 1–1.8 mm. long, slightly pubescent; racemes conical, acute, 7–8 mm. wide, simple, terminal, with a short peduncle, the axis 2.5–11 cm. long, finely pubescent, striate, bracteate, the bracts filiform, 1.5–1.8 mm. long, 0.5–0.8 mm. wide, deciduous, ciliate, 1-nerved, glabrous beneath; flowers 3.2–4.2 mm. long, the pedicels short, inconspicuous; outer sepals free, lanceolate, concave, ciliate, acute, the two lower ones 1.4–2 mm. long, 0.6–0.8 mm. wide, 1-nerved, the upper sepal 2–2.5 mm. long, 1–1.2 mm. wide, 3-nerved, sometimes 5-nerved; wings blue, 3–4 mm. long, 2–2.8 mm. wide, obovate, acute at base, 3-nerved, ciliate; keel 3.2–4.4 mm. long, 1.8–2 mm. wide, orbicular, plicate, glabrous within, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-emarginate, larger, ciliate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3–3.6 mm. long, united two-thirds their length, the free part 1–1.2 mm. long, glabrous, the anthers emarginate; ovary elliptic, 1–2.4 mm. long, 0.6–1.8 mm. wide, densely pubescent, the hairs rigid, ascendent, short; style 2–2.6 mm. long, geniculate above base, glabrous, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; fruit more or less samaroid, cordiform, 3–4 mm. long, 2.2–2.6 mm. wide, conspicuously canescent-pubescent, usually acute at apex, emarginate at base, the wings inconspicuous, the body rugose-reticulate.

Distribution: Southern Andes of Ecuador, between 2100 and 2600 meters altitude. Also in northern and central Peru.

Chimborazo: Cañón of the Río Chanchán, near Huigra, *Camp* 2995 (NY), 3058 (NY).

Cañar: Near the village of San Marcos, 5–8 km. northeast of Azogues, *Camp* 2490 (NY).

Azuay: At Baños, near Cuenca, *Penland & Summers* 1058 (Ch, NY); near Baños, along Río Tarqui, south of Cuenca, *Camp* 1836 (NY); between El Pan and Guachapala, *Camp* 5263 (NY); near the village of Girón, *Camp* 2199 (NY).

Loja: Between Loja and San Lucas, *Hitchcock* 21450 (US); "Prope Loxa", *Hartweg* 713 (fragments of type of *Monnina leptostachya*, Ch, US; photographs of type Ch, US).

The lanceolate or elliptic leaves, the conspicuous free part of the filaments, and the samaroid, cordiform, and pubescent fruit characterizes this annual species. The cited photographs and fragments of the type of *M. leptostachya* indicate that Bentham's entity cannot be differentiated from *M. herbacea*, typified by *Lagasca* 53, from Peru. The Peruvian distribution of the species is discussed in Jour. Arn. Arb. 27: 136. 1946.

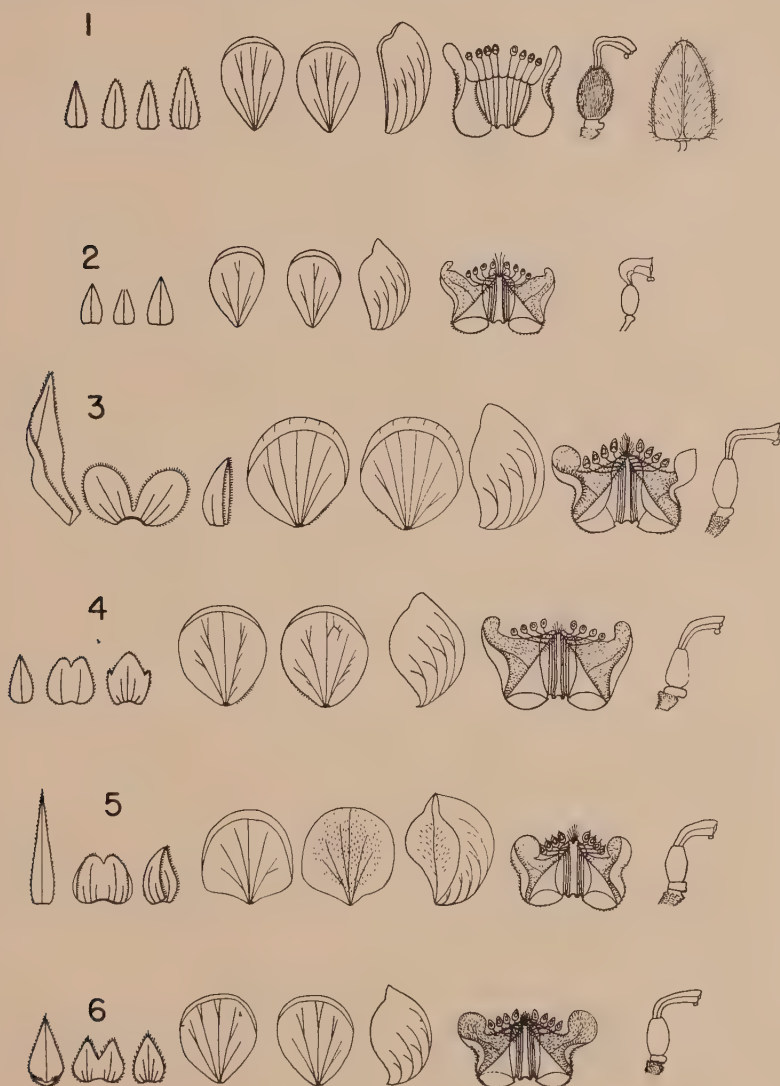


FIG. 1. *Monnina herbacea*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium, fruit; all $\times 3$.

FIG. 2. *Monnina spruceana*: left to right, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 3. *Monnina cuspidata*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 4. *Monnina subspiciosa*: left to right, bract, lower sepals, upper sepal, wings (inner), wing (outer), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 5. *Monnina trichoptera*: left to right, bract, lower sepals, upper sepal, wing (inner), wing (outer), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 6. *Monnina media*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

2. *MONNINA SPRUCEANA* Chodat in Bull. Herb. Boiss. 2: 167. 1894.

Annual, to 9 dm. high; stem erect, 2–2.5 mm. in diameter, glabrous, cylindric, branched in the upper part, the branches 19–35 cm. long, more or less corymbose, glabrescent; leaves linear-lanceolate, 11–68 mm. long, 1.8–18 mm. wide, acuminate, rarely more or less acute, mucronate, glabrescent, entire, attenuate at base, the costa prominulous beneath, with 6–8 pairs of lateral veins; petioles 1–2 mm. long, concave above, convex beneath, strigose; racemes conical, acuminate, 6–7 mm. wide, simple, terminal or axillary, pedunculate (peduncle 12–25 mm. long), the axis 4–18 cm. long, strigose, striate, bracteate, the bracts filiform, 2–2.8 mm. long, 0.4–0.5 mm wide, deciduous, ciliate, 1-nerved, glabrous; flowers 3–3.2 mm. long, the pedicels 0.6–1 mm. long, glabrescent; outer sepals free, ovate-triangular, acute, glabrous, 1-nerved, the two lower ones 1–1.6 mm. long, 0.5–0.8 mm. wide, the upper sepal 1.4–2 mm. long, 0.7–1 mm. wide, wings 2.8–3.5 mm. long, 1.8–2 mm. wide, obovate, acute at base, 3-nerved, glabrous; keel 3–4 mm. long, 1.8–2 mm. wide, orbicular, plicate, glabrous within, obtuse at base, 3-nerved, inconspicuously 3-lobed, the middle lobe obtuse-subemarginate; upper petals elongate, more or less spatulate, pubescent; stamens 8, the filaments 2.2–2.8 mm. long, almost entirely united, the free part 0.3–0.5 mm. long, glabrous; ovary ovoid, 1–1.2 mm. long, 0.4–0.6 mm. wide, glabrous; style 1.4–2 mm. long, conspicuously curved, slightly 2-auricled, thicker toward apex, glabrous; stigma with 2 lobes, the lower one acute, the upper one 1-tubercled, the tubercle papillose; samara ellipsoid, 2.8–4.8 mm. long, 1.5–3.8 mm. wide, conspicuously winged, the wing 0.8–1 mm. wide, deeply emarginate at apex and base, strigillose, the body rugose-reticulate.

Distribution: In the Central Andes of Ecuador, between 1200 and 2000 meters altitude.

Chimborazo: Huigra, *Hitchcock* 20612 (GH, NY, US); vicinity of Huigra, *Rose & Rose* 23853 (GH, NY, US); vicinity of Huigra, mostly on the Hacienda de Licay, *Rose & Rose* 22213 (GH, NY, US); Cañón of the Río Chanchán, near Huigra, *Camp* 2940 (NY), 2954 (NY), 2956 (NY), 2996 (NY); roadside above Sibambe, *Haught* 3323 (GH, US); Naríz del Diablo, *Asplund* 6848 (US).

Prov.? "In Andibus Ecuadorensibus", *Spruce* 5977 (type coll. NY, US; photographs of type Ch, US).

This species is closely related to *M. herbacea* DC., from which it differs in its glabrescent habit, its linear leaves, its glabrous ovary with auricled style, and its conspicuously winged fruit.

3. *MONNINA CUSPIDATA* Benth. Pl. Hartw. 162. 1845.

Monnina patula Chodat in Bull. Herb. Boiss. 3: 131. 1895.

Fruticose, branched, the branches 2.5–8 mm. in diameter, conspicuously hirsute, more or less striate; leaves ovate-lanceolate, 40–120 mm. long, 16–40 mm. wide, acuminate, hirsute above, becoming more or less glabrescent, canescent-hirsute beneath, entire, attenuate at base, the costa prominulous beneath, with 7 or 8 pairs of lateral veins; petioles 3–8 mm. long, concave above, convex beneath, hirsute; inflorescence paniculate, the axis 6.5–16.5 cm. long, 2–4 mm. in diameter, striate, hirsute, the lateral branches 2.5–12 cm. long, 8–9 mm. wide, acute at

apex, pedunculate (peduncle 8-42 mm. long), bracteate, the bracts more or less lanceolate, hood-shaped at base, 5.5-7.5 mm. long, 2.4-2.6 mm. wide, acuminate, ciliate, deciduous, 1-nerved, glabrescent beneath; flowers 4.4-5.6 mm. long, the pedicels 1-1.2 mm. long, finely pubescent;



FIG. 7. *Monnina subscandens*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 8. *Monnina pseudo-pilosa*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 9. *Monnina pilosa*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 10. *Monnina paniculata*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 11. *Monnina denticulata*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium, fruit; all $\times 3$.

FIG. 12. *Monnina revoluta*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

outer sepals ovate-triangular, obtuse, ciliate, glabrous beneath, 3-nerved, the two lower ones 1.8–2.5 mm. long, 1–2 mm. wide, inconspicuously united at base, the upper sepal 2–2.8 mm. long, 1.2–2.2 mm. wide; wings 4.5–5.2 mm. long, 3.5–4.4 mm. wide, obovate, obtuse at base, 3-nerved, ciliate; keel 4.4–5.8 mm. long, 2.6–3.2 mm. wide, orbicular, plicate, glabrous within, obtuse at base, 3-nerved, 3-lobed, the lobes inconspicuous; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3.5–4 mm. long, almost entirely united, the free part 0.8–1.5 mm. long, glabrous; ovary elliptic, 1.6–2 mm. long, 0.8–1 mm. wide, glabrous; style 2.2–3.2 mm. long, geniculate above base, glabrous, thicker toward apex; stigma with 2 lobes, the lower one acute the upper 1-tubercled, the tubercle papillose; fruit unknown.

Distribution: Andes of northern Ecuador, between 3000 and 3300 meters altitude.

Pichincha: "In sylvis Guayan", *Hartweg* 903 (fragments of type Ch, US; photographs of type Ch, GH, US); without locality, *Ex Herb. Thurber* s. n. (GH).

Prov. ? : Without locality, *Jameson* 112 (GH); *Couthouy* s.n. (GH).

This shrub is distinguished by having the habit conspicuously hirsute, the leaves ovate-lanceolate and acuminate, and the flower-subtending bracts lanceolate (up to 7.5 mm long) and hood-shaped at base. It is a close relative of *M. pilosa* H.B.K., differing in its narrower acuminate leaves, its lanceolate flower-subtending bracts, its united lower sepals, etc. The original description of *M. patula* Chodat indicates that it is identical with *M. cuspidata*, and in both cases the type collection came from the same region (Province of Pichincha).

4. *MONNINA SUBSPECIOSA* Chodat in Bull. Soc. Bot. Genève II. 25: 203. 1934.

Shrub to 5 m. high, branched, the branches 2–4 mm. in diameter, slightly pubescent, becoming glabrescent, striate; leaves elliptic, coriaceous, 63–115 mm. long, 30–55 mm. wide, acute, mucronate, glabrous above, glabrescent beneath, entire, more or less attenuate at base, the costa prominulous beneath, with 7 or 8 pairs of lateral veins; petioles 3–8 mm. long, concave above, convex beneath, glabrescent; inflorescence paniculate, the axis 9.5–15 cm. long, 1.2–2.2 mm. in diameter, striate, glabrescent, the lateral branches numerous, acute at apex, 3–8 cm. long, 8–9 mm. wide, pedunculate (peduncle 5–18 mm. long), bracteate, the bracts linear-lanceolate, acute, 1.8–2.2 mm. long, 1–1.2 mm. wide, glabrescent beneath, 1-nerved, ciliate, deciduous, inconspicuous; flowers 4.5–5 mm. long, the pedicels 1–1.2 mm. long, finely pubescent; outer sepals ovate-triangular, obtuse, ciliate, glabrescent beneath, the two lower ones 1.8–2 mm. long, 0.9–1 mm. wide, $\frac{1}{2}$ united, 1-nerved, rarely 3-nerved, the upper sepal 2–2.2 mm. long and wide, 5-nerved; wings blue, 4.2–4.5 mm. long, 3.5–3.8 mm. wide, obovate, almost obtuse at base, 3-nerved, glabrous, ciliate; keel 4.5–5 mm. long, 2.8–3 mm. wide, orbicular, plicate, glabrous within, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-emarginate, smaller; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3–3.2 mm. long, almost entirely united, the free part 0.4–0.8 mm. long, glabrous; ovary ovoid, 1.6–1.8 mm.

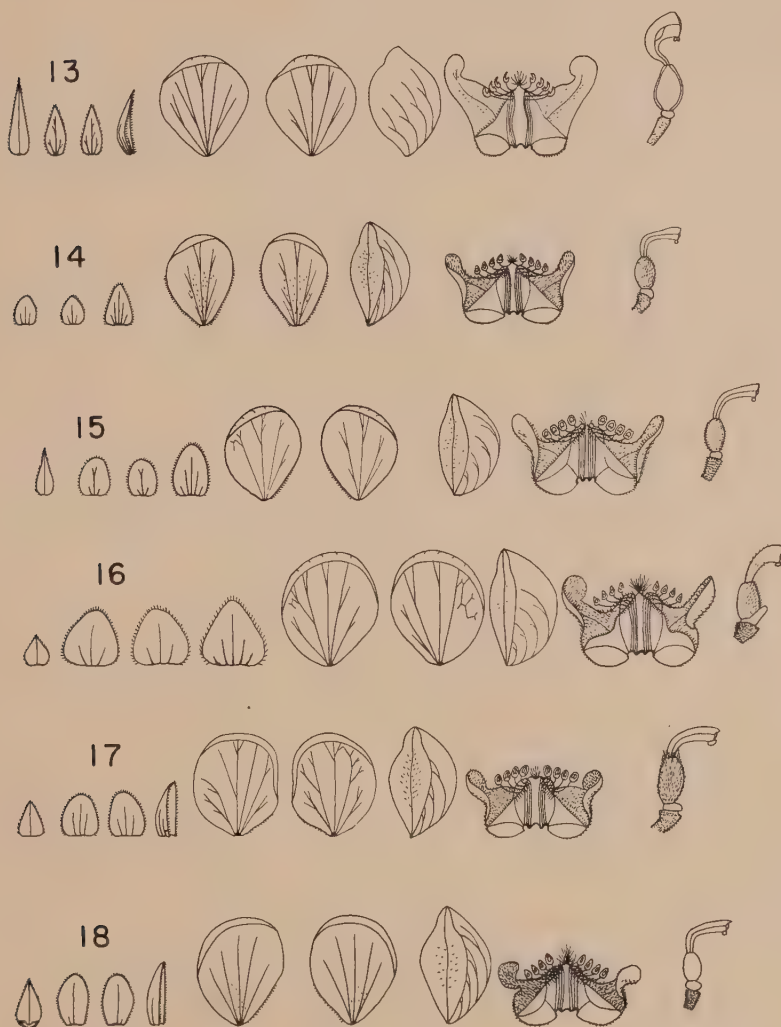


FIG. 13. *Monnina pterocarpa*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 14. *Monnina andreana*: left to right, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 15. *Monnina chimborazoana*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 16. *Monnina decurrens*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 17. *Monnina loxensis*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 18. *Monnina obovata*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

long, 0.8–1 mm. long, 0.8–1 mm. wide, glabrous; style 2–2.2 mm. long, geniculate above base, glabrous, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe more or less ellipsoid, conspicuously acuminate at apex, 6–6.5 mm. long, 2.8–3 mm. wide, glabrous, reticulate.

Distribution: Andean region of northern Ecuador, at an altitude of about 1800 meters; also occurring in central and southern Colombia.

Pichincha: Bosque subandino de Saloya, *Acosta Solís* 5613 (Ch).

This plant is near *M. speciosa* Tr. & Pl., from Colombia, but is quite distinct in its woody, erect habit, its elliptic, coriaceous, acute, mucronate leaves, its flower-subtending bracts being inconspicuous (up to 2.2 mm. long), and its fruit being acuminate at apex. It also suggests *M. subscandens* Tr. & Pl., from which it differs in its obtuse outer sepals, its glabrous wings, keel and ovary, and in its habit, *M. subscandens* being a liana. The type collection of *M. subspeciosa* is *Pennell & Killip* 5888, from the Department of El Valle, Colombia; it agrees very well with the cited Ecuadorean specimen.

5. *MONNINA TRICHOPTERA* Diels in *Bibl. Bot.* **116**: 102. 1937.

Shrub, 2–3 m. high, branched, the branches 2–8 mm. in diameter, strigose, striate; leaves more or less lanceolate, 48–187 mm. long, 13–68 mm. wide, herbaceous, conspicuously acuminate, glabrous, entire, attenuate at base, the costa prominulous beneath, with 8 or 9 pairs of lateral veins; petioles 3–7 mm. long, concave above, convex beneath, more or less strigose, slightly winged, articulate; inflorescence paniculate, the axis 6–16 cm. long, 2–3 mm. in diameter, striate, strigose, the lateral branches 2–11 cm. long, 7–9 mm. wide, acuminate at apex, pedunculate (peduncle 6–20 mm. long), bracteate, the bracts linear, 3.8–4.8 mm. long, 0.8–1 mm. wide, deciduous, ciliate, 1-nerved, slightly pubescent beneath; flowers 3.8–4.5 mm. long, the pedicels 0.4–0.5 mm. long, glabrescent; outer sepals ovate-triangular, obtuse, ciliate, finely pubescent beneath, becoming glabrescent, the two lower ones 2–2.2 mm. long, 1.2–1.4 mm. wide, two-thirds united, 3-nerved (nerves inconspicuous), the upper sepal 2.2–2.5 mm. long, 2–2.2 mm. wide, 5-nerved, rarely 3-nerved (nerves inconspicuous); wings 4–4.2 mm. long and wide, obovate, acute at base, 3-nerved, finely pubescent beneath; keel 4–5

EXPLANATION OF FIGURES 19–25

FIG. 19. *Monnina angustata*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 20. *Monnina salicifolia*: left to right, bract, lower sepals, upper sepal, wing (inner), wing (outer), keel, upper petals and stamens, gynaecium; all $\times 3$.

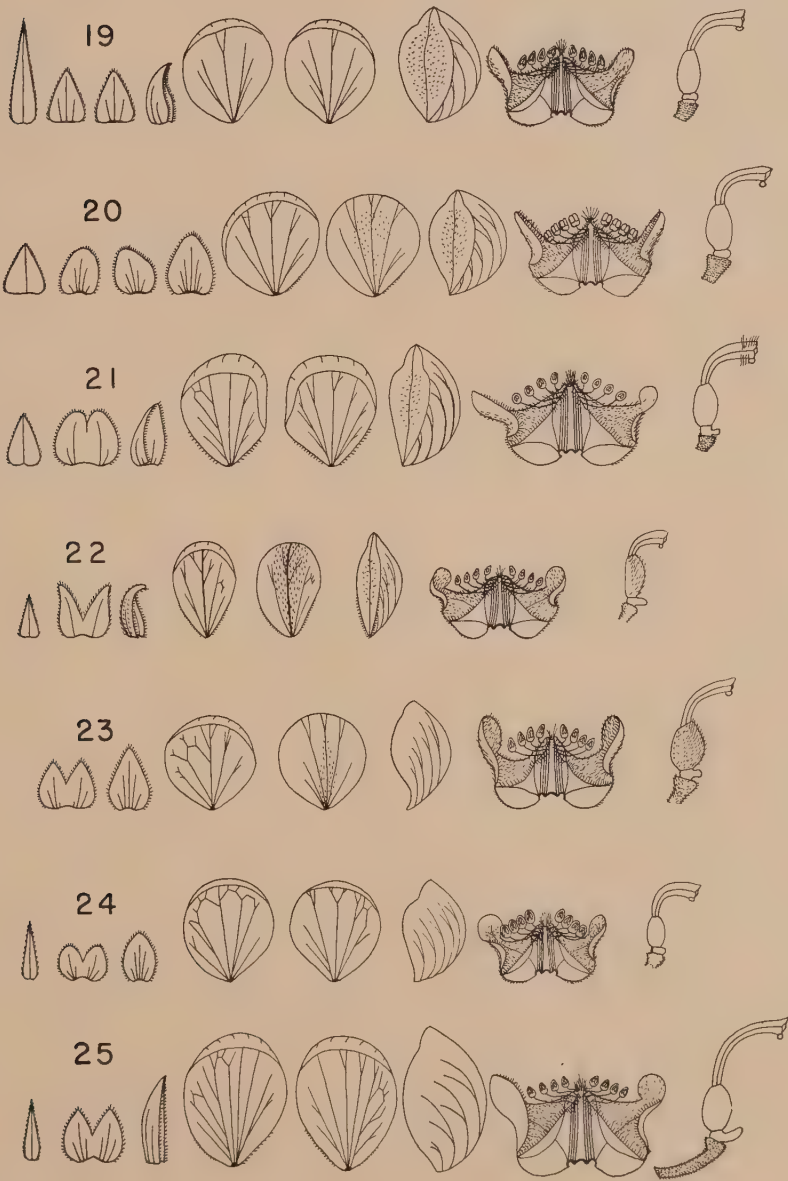
FIG. 21. *Monnina crassifolia*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 22. *Monnina equatoriensis*: left to right, bract, lower sepals, upper sepal, wing (inner), wing (outer), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 23. *Monnina myrtoides*: left to right, lower sepals, upper sepal, wing (inner), wing (outer), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 24. *Monnina rupestris*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 25. *Monnina haughtii*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.



mm. long, 2.8–3.8 mm. wide, orbicular, plicate, pubescent within, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-subemarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 2.6–3 mm. long, almost entirely united, the free part 0.4–0.6 mm. long, glabrous; ovary ovoid, 1–1.6 mm. long, 0.8–1 mm. wide, glabrous; style 1.6–2 mm. long, geniculate near base, glabrous, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 6–9 mm. long, 5.5–6 mm. wide, glabrous, reticulate, obtuse at apex.

Distribution: Eastern Cordillera of central Ecuador, between 360 and 1500 meters altitude.

Napo-Pastaza: Puyo, *Mexia* 6958 (NY, US); vicinity of Puyo, *Skutch* 4399 (Ch, US); Valley of the Río Pastaza, near El Topo, *Camp* 2401 (NY).

Prov. ? : "In m. Abitagua", *Spruce* s.n. (K).

This entity is close to *M. subspeciosa* Chodat, from which it differs in having herbaceous, lanceolate, acuminate leaves, conspicuous flower-subtending bracts (up to 4.8 mm. long), almost sessile flowers, the lower sepals two-thirds united, and the drupe obtuse at apex. The type collection is *Diels 1017* from the Province of Tungurahua, which I have not seen; the original description fits very closely the specimen cited above.

6. *Monnina media* Ferreyra, sp. nov.

Frutex scandens ad 5 m. altus, ramosus, ramis 1.2–3 mm. diametro hirsutis striatis; foliorum laminis plus minusve ellipticis, 65–152 mm. longis, 27–67 mm. latis, textura herbaceis, apice acuminatis, supra strigosis, subtus canescenti-hirsutis, integris, basi attenuatis, costa subtus prominula, nervis lateralibus utrinsecus 10–12; petiolis 3–6 mm. longis, supra concavis subtus convexis, hirsutis, articulatis; inflorescentia paniculata, rhachi 4–15 cm. longa, 0.8–1 mm. diametro, hirsuta, ramulis lateralibus adscendentibus 3.5–7.5 cm. longis et floribus inclusis 6–8 mm. latis, apice elongato-acuminatis, pedunculatis (pedunculo 6–10 mm. longo), bracteatis, bracteis deltoideis, 1.8–2.8 mm. longis, 1–1.4 mm. latis, acuminatis, ciliatis, subtus pubescentibus, 1-nerviis, basi cucullatis, deciduis; floribus 3.6–4.2 mm. longis, pedicellis inconspicuis 0.4–0.6 mm. longis minute pubescentibus; sepalis exterioribus deltoideis acutis ciliatis, subtus leviter pubescentibus, duobus inferioribus 1.5–1.8 mm. longis et 1–1.2 mm. latis $\frac{1}{2}$ connatis 3-nerviis, sepalo superiore 2–2.1 mm. longo et 1.2–1.4 mm. lato, 5 (raro 3-)nervio; alis obovatis 3.8–4 mm. longis et 3–3.2 mm. latis, glabris, basi obtusis, 3-nerviis, eciliatis; carina orbiculari plicata 4–4.4 mm. longa et 2.2–2.4 mm. lata, intus glabra, basi obtusa, 3-nervia, 3-lobata, lobo mediano obtuso-subemarginato minore; petalis superioribus elongato-spathulatis pubescentibus; staminibus 8, filamentis 2.5–3 mm. longis fere ad apicem connatis, parte libera 0.5–1 mm. longa, glabris; ovario ellipsoideo glabro 1.2–1.6 mm. longo et 0.8–1 mm. lato; stylo 2–2.2 mm. longo supra basim geniculato, glabro, plus minusve cylindrico; stigmatibus bilobatis, lobo inferiore acuto, superiore 1-tuberculato, tuberculo papilloso; drupa ellipsoidea 6–7 mm. longa et 3–4 mm. lata, glabra, reticulata.

Distribution: Known only from the type collection.

Type in the herbarium of the New York Botanical Garden, collected in Moro-Moro region, about 21 miles west of Portovelo, Province El Oro, Ecuador, alt. 1020–1260 meters, October 7, 1944, by W. H. Camp (No. E-629).

The proposed species is very closely related to *M. subscandens* Tr. & Pl., but it is distinct in its conspicuously hirsute habit, its leaves with 10–12 pairs of lateral veins, its glabrous wings and keel, its glabrous

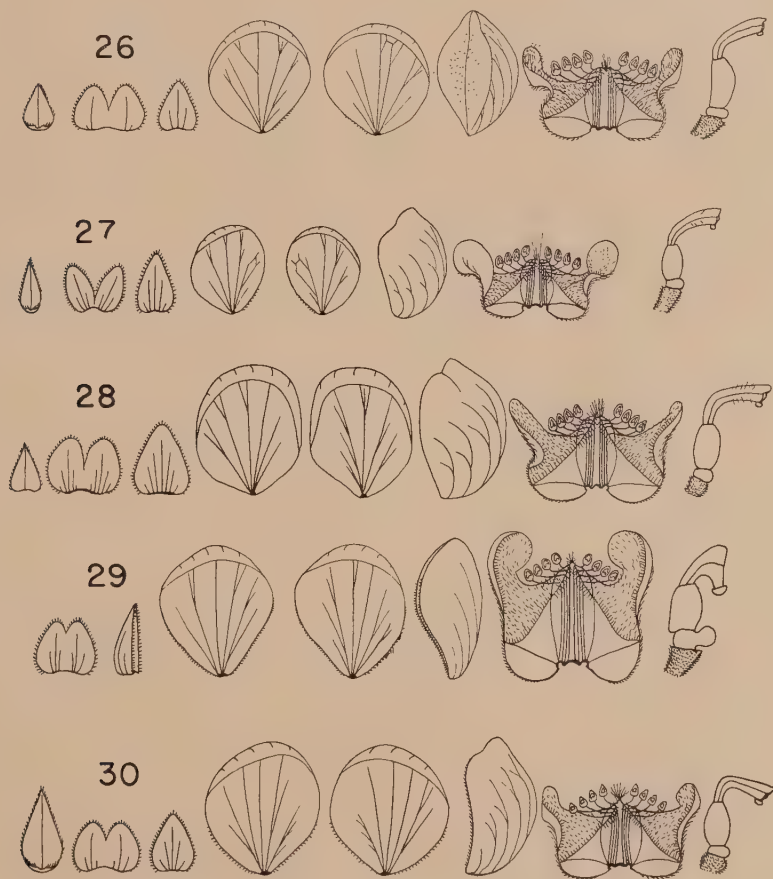


FIG. 26. *Monnina lingua*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 27. *Monnina phytolaccifolia*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 28. *Monnina obtusifolia*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 29. *Monnina pseudo-aestuans*: left to right, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

FIG. 30. *Monnina aestuans*: left to right, bract, lower sepals, upper sepal, wings (inner), keel, upper petals and stamens, gynaecium; all $\times 3$.

ovary, etc. It is also near *M. trichoptera* Diels, from which it differs in having conspicuously hirsute branches, the leaves being canescent-pubescent, the flower-subtending bracts triangular, and the wings and keel glabrous.

7. *MONNINA SUBSCANDENS* Tr. & Pl. in Ann. Sci. Nat. IV. 17: 143. 1862.

Scandent, to 2 m. high, branched, the branches 5–7 mm. in diameter, terete, finely pubescent, becoming glabrescent; leaves elliptic-lanceolate, 50–135 mm. long, 18–47 mm. wide, acuminate, strigose, becoming glabrescent, entire, attenuate at base, the costa prominulous beneath, with 7 or 8 pairs of lateral veins; petioles 2–5 mm. long, concave above, convex beneath, strigose; inflorescence paniculate, the axis 9–12.5 cm. long, 1.5–2 mm. in diameter, striate, strigose, the lateral branches numerous, acute at apex, 3–11 cm. long, 9–11 mm. wide, pedunculate (peduncle 15–30 mm. long), bracteate, the bracts linear, 2.5–3.5 mm. long, 0.8–1.2 mm. wide, acuminate, glabrescent beneath, ciliate, deciduous, 1-nerved; flowers 5–6 mm. long, the pedicels 1.5–1.8 mm. long, finely pubescent; outer sepals more or less triangular, acute, ciliate, glabrescent beneath, the two lower ones 2.2–3 mm. long, 1–1.2 mm. wide, two-thirds (rarely $\frac{1}{2}$) united, 3-nerved, the nerves inconspicuous, the upper sepal 3.2–4 mm. long, 1.8–2 mm. wide, 5-nerved; wings purple, 5–5.2 mm. long, 4–4.5 mm. wide, obovate, obtuse at base, rarely more or less acute, 3-nerved, slightly pubescent beneath, ciliate; keel 5.5–6.2 mm. long, 3–3.5 mm. wide, orbicular, plicate, pubescent within, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-emarginate, smaller; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 4–4.2 mm. long, almost entirely united, the free part 0.5–1 mm. long, pubescent; ovary elliptic, 1.8–2 mm. long, 1–1.2 mm. wide, pubescent, the hairs conspicuous at the upper part; style 2.8–3 mm. long, geniculate above base, almost cylindric, glabrous; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 6–10 mm. long, 2.8–7 mm. wide, slightly pubescent, becoming glabrescent, reticulate.

Distribution: Southern part of the Ecuadorean Andes, about 2195 meters altitude; also in the Andes of central and southern Colombia.

Santiago-Zamora: Between Campanas and Arenillas, along Río Tintas, *Steyermark* 53564 (Ch, US); Oriente, Cordillera Cutucú, *Camp* 1183 (NY).

This plant is distinguished by its scandent habit, its panicle with numerous lateral branches, its pubescent ovary, etc. In connection with the present work the writer has examined fragments and photographs of the type, collected by Triana in the Department of Tolima, Colombia.

8. *MONNINA SODIROANA* Chodat in Engl. Bot. Jahrb. 36: 379. 1905.

Suffruticose, 2–3 m. high, branched, the branches 6–7 mm. in diameter, slightly pubescent, becoming glabrescent, striate; leaves elliptic or obovate-elliptic, 14–22.5 cm. long, 7.7–12 cm. wide, more or less acuminate, sometimes acute, glabrous, entire, attenuate at base, the costa prominulous beneath, with 9 or 10 pairs of lateral veins; petioles

5–6 mm. long, concave above, convex beneath, glabrescent; inflorescence paniculate, the axis 20–40 cm. long, 4–6 mm. in diameter, striate, strigose, the lateral branches almost acute at apex, 15–16.5 cm. long, 10–12 mm. wide, pedunculate (peduncle 35–50 mm. long), bracteate, the bracts ovate-triangular, 6–7 mm. long, pubescent beneath, ciliate, deciduous; flowers 5–7 mm. long, with a short pedicel; outer sepals ovate or elliptic, free, ciliate; wings elliptic-orbicular, ciliate; keel orbicular, plicate; upper petals elongate-spatulate; ovary glabrous; style erect, becoming slightly geniculate.

Distribution: Andes of northern Ecuador, at about 900 meters altitude.

Pichincha: "M. Pilaton", *Sodiro* 96 (photographs of type Ch. US).

The writer has seen no material of this species, but the original description and the photographs of the type indicate conspicuous characters which suggest a close relationship to *M. bracteata* Chodat, endemic in central and northern Colombia, from which it differs in having elliptic and glabrous leaves, in the bracts being ovate-triangular, etc. The present species is also closely allied to *M. latifolia* (Bonpl.) DC., but differs in its elliptic and glabrous leaves, its paniculate inflorescence, its ovate-triangular bracts, etc.

9. *Monnina pseudo-pilosa* Ferreyra, sp. nov.

Frutex ramosus, ramis 2.5–3 mm. diametro striatis canescenti-tomentosis; foliorum laminis anguste lanceolatis, 48–110 mm. longis, 12–26 mm. latis, acuminatis, integris, basi attenuatis, supra strigosis, subtus canescenti-pubescentibus, costa subtus prominula, nervis lateralibus utrinsecus 7 vel 8; petiolis 3–7 mm. longis, supra concavis subtus convexis, plus minusve tomentosis, articulatis; inflorescentia paniculata, rhachi 5–8.5 cm. longa, 1–1.5 mm. diametro, striata, canescenti-tomentosa, ramulis lateralibus 1.5–3 cm. longis et floribus inclusis 8–9 mm. latis, apice acutis, pedunculatis (pedunculo 3–5 mm. longo), bracteatis, bracteis linearibus, 2.2–2.8 mm. longis et 0.5–0.7 mm. latis, acuminatis, subtus pubescentibus, ciliatis, 1-nerviis, deciduis; floribus 4–4.2 mm. longis, pedicellis 1.6–1.8 mm. longis minute pubescentibus; sepalis exterioribus liberis fere lanceolatis, ciliatis, subtus glabrescentibus, duobus inferioribus 2–2.2 mm. longis et 0.8–0.9 mm. latis acuminatis 1-nerviis, sepalo superiore 2.4–2.5 mm. longo et 0.9–1.1 mm. lato, acuto, 3-nervio; alis obovatis 3.8–4 mm. longis et 2.4–2.8 mm. latis, basi subacutis, 3-nerviis, ciliatis; carina orbiculari plicata 4.2–4.4 mm. longa et 2.2–2.4 mm. lata, intus leviter pubescente, basi obtusa, 3-nervia, inconspicue 3-lobata, lobo mediano obtuso-submarginato; petalis superioribus elongato-spathulatis pubescentibus; staminibus 8, filamentis 3–3.2 mm. longis fere ad apicem connatis, parte libera 0.5–1.2 mm. longa, glabris; ovario ovoideo glabro 1–1.2 mm. longo et 0.7–0.8 mm. lato; stylo 2.8–3 mm. longo medium versus geniculato, glabro, superne paullo incrassato; stigmatibus bilobato, lobo inferiore acuto, superiore 1-tuberculato, tuberculo papilloso; drupa non visa.

Distribution: Known only from the type collection.

Type in the U. S. National Herbarium, No. 941323, collected on slopes of Mt. Corazón, Province of Pichincha, Ecuador, alt. 3000 meters, January 14, 1881, by F. C. Lehmann (No. 503a).

The proposed species seems very closely related to *M. pilosa* H.B.K., from which it differs in its narrowly lanceolate, acuminate leaves, its linear flowers-subtending bracts, and in its lower sepals being acuminate and 1-nerved.

10. *MONNINA PILOSA* H.B.K. Nov. Gen. & Sp. 5: 419. 1821.

Shrub to 4.5 m. high, branched, the branches 3–7 mm. in diameter, conspicuously hirsute, striate; leaves usually elliptic, rarely oblong, sometimes more or less lanceolate, 31–175 mm. long, 11–72 mm. wide, usually acute, sometimes acuminate, hirsute above, becoming glabrescent, canescent-hirsute beneath, entire, attenuate at base the costa prominent beneath, with 9 or 10 pairs of lateral veins; petioles 2–7 mm. long, concave above, convex beneath, hirsute, slightly winged; inflorescence paniculate, the axis 4–16 cm. long, 1.5–3.5 mm. in diameter, striate, hirsute, the lateral branches lax, acute at apex, 2–9.5 cm. long, 8–10 mm. wide, pedunculate (peduncle 5–10 mm. long), conspicuously bracteate, the bracts ovate, concave, acute, 2.4–6 mm. long, 1.4–3 mm. wide, hood-shaped at base, deciduous, ciliate, 1-nerved, rarely 3-nerved, pubescent beneath, the hairs conspicuous at base; flowers 4.5–4.8 mm. long, pedicels 1.2–1.5 mm. long, finely pubescent; outer sepals free, ovate-triangular, more or less obtuse, ciliate, slightly pubescent beneath, becoming glabrescent, the two lower ones 1.4–3.6 mm. long, 1–1.8 mm. wide, 3-nerved, the upper sepal 2–3.8 mm. long, 1–2 mm. wide, usually 3-nerved, sometimes 5-nerved; wings 4–5 mm. long, 3–4.5 mm. wide, obovate, obtuse at base, 3-nerved, glabrous, ciliate; keel 4.5–5.2 mm. long, 2.6–2.8 mm. wide, orbicular, plicate, glabrous within, sometimes slightly pubescent, ciliate, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-subemarginate, the lateral ones more or less acute; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 2.8–3.2 mm. long, almost entirely united, the free part 0.5–1 mm. long, glabrous; ovary ovoid, 1.6–2 mm. long, 0.8–1.2 mm. wide, glabrous; style 2.2–2.8 mm. long, geniculate above base, glabrous, almost cylindric; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 5.5–7 mm. long, 3.2–4 mm. wide, glabrous, reticulate.

Distribution: Along the Andes from southern Colombia into Ecuador and northern Peru, between 1100 and 3300 meters altitude.

Carchi: Between Paja Blanca and El Cucho, *Acosta Solís* 10521 (Ch)

Pichincha: Between Volcán Atacaso and Volcán Pichincha, along Río Saloya, *Steyermark* 52467 (Ch, US); "Sylvis Guayan montis Pichincha," *Hartweg* 902 (Ch).

Bolívar: Near Balsapampa, Western Cordillera, *Rimbach* 204 (Ch, GH, NY, US); Hacienda Talahua, *Penland & Summers* 605 (Ch, NY).

Chimborazo: Between Guayllanac and Hacienda "La Carmela", Cordillera Occidental, *Acosta Solís* 5308 (Ch); Hacienda "La Carmela," Sibambe, *Acosta Solís* 5435 (Ch); cañón of the Río Chanchán, near Huigra, *Camp* 3321 (NY).

Azuay: Nudo de Portete, pass between headwaters of the ríos Tarqui and Girón, *Camp* E-2166 (NY), 2185 (NY), 2183 (NY); Eastern Cordillera, 1–8 km. north of the village of Sevilla de Oro, *Camp* E-4255 (NY), 4541 (NY).

Loja: Vicinity of Las Juntas, *Rose, Pachano & Rose* 23242 (GH, NY, US); Las Chinchas, Region Central, *Acosta Solis* 7738 (Ch); around Tambo Cachiyacu, about 2 leagues southeast of Yangana, *Steiermark* 54816 (Ch).

Prov. ? : "In Andibus Ecuadorensibus," *Spruce* 5004 (GH, K), 5168 (K, NY); without locality *collector* ? 902 (K).

This species is characterized by having its branches conspicuously hirsute, its leaves elliptic or oblong, its inflorescence paniculate, and its flower-subtending bracts broadly acute-triangular and hood-shaped at base. Fragments and a photograph of the type (*Bonpland* 3490), from Ayavaca, northern Peru, were available to the writer.

11. *MONNINA PILGERI* Chodat in Engl. Bot. Jahrb. **36**: 378. 1905.

Fruticose; stem slightly striate, branched, the branches to 6 mm. in diameter, more or less pubescent; leaves elliptic, 104–120 mm. long, 43–53 mm. wide, acuminate, glabrous, entire, attenuate at base, the costa prominulous beneath, with 5 or 6 pairs of lateral veins; petioles 4–6 mm. long, concave above, convex beneath, slightly pubescent; inflorescence paniculate, the axis 9.5 cm. long, pubescent, striate, conspicuously bracteate, the bracts acute-triangular, 7 mm. long, 5 mm. wide, deciduous, ciliate, hood-shaped at base, concave; flowers 5.5 mm. long, shortly pedicellate; outer sepals free, elliptic-lanceolate, 4- or 5-nerved, the nerves conspicuous, ciliate, pubescent beneath; wings obovate, slightly concave, glabrous; keel orbicular, plicate; upper petals spatulate, suborbicular, pubescent; stamens more or less tomentose, the filaments glabrescent; ovary ovoid, glabrous; style geniculate, glabrous; stigma tuberculate; fruit unknown.

Distribution: Northern Andes of Ecuador.

Pichincha: "In silva Canzacoto", *Sodi* 101 (photograph of type Ch, US).

I have seen no material of this binomial, and the description given above is adapted from the original. The species seems very closely related to *M. pilosa* H.B.K., from which it differs in its glabrescent upper branches, its glabrous leaves with about 6 pairs of lateral veins, etc.

12. *MONNINA PANICULATA* Benth. Pl. Hartw. 126. 1844.

Shrub to 3 m. high, branched, the branches 1.6–3.5 mm. in diameter, conspicuously hirsute, striate; leaves elliptic, sometimes more or less oblong, 32–110 mm. long, 16–50 mm. wide, usually acute, rarely almost obtuse, hirsute above, becoming glabrescent, canescent-hirsute beneath, entire, attenuate at base, the costa prominulous beneath, with 8 or 9 pairs of lateral veins; petioles 2–5 mm. long, concave above, convex beneath, hirsute, articulate; inflorescence paniculate, the axis 12.5–28 cm. long, 1–1.5 mm. in diameter, striate, hirsute, the lateral branches acute at apex, 3–17.5 cm. long, 7–9 mm. wide, pedunculate (peduncle 4–20 mm. long), bracteate, the bracts triangular, acute, 1.5–2 mm. long, 1–1.4 mm. wide, deciduous, ciliate, 1-nerved, slightly pubescent beneath, becoming glabrescent, inconspicuous; flowers 4.2–4.6 mm. long, the pedicels 0.5–0.8 mm. long, finely pubescent; outer sepals free, ovate-triangular, acute, ciliate, slightly pubescent beneath, becoming glabrescent, the two lower ones 1.5–2 mm. long, 1.2–1.4 mm. wide, 3-nerved,

the upper sepal 2–2.2 mm. long, 1.6–1.8 mm. wide, 5-nerved; wings purple, 4.2–4.5 mm. long, 3.2–4 mm. wide, obovate, obtuse at base, 4-nerved, glabrous; keel 4.6–5 mm. long, 3–3.2 mm. wide, orbicular, plicate, glabrous within, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-subemarginate, smaller; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3–3.2 mm. long, almost entirely united, the free part 0.5–0.8 mm. long, glabrous; ovary ovoid, 1.2–1.5 mm. long, 0.8–1 mm. wide, glabrous; style 2.6–3 mm. long, geniculate in the middle part, glabrous, almost cylindric; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 5–6.5 mm. long, 3–4.2 mm. wide, glabrous, reticulate.

Distribution: Southern Andes of Ecuador, at an altitude of about 850 meters.

Azuay: Hacienda Yubay, at Sanaguín, on south side of Río Patul, *Steyermark* 52695 (Ch, US).

Loja: Paccha, *Hartweg* 715 (fragments of type US).

The wide panicle and the conspicuously hirsute habit characterize this shrub.

13. *MONNINA DENTICULATA* Chodat in Bull. Herb. Boiss. **3**: 135. 1895.

Shrub to 2 m. high, branched, the branches 1.8–5 mm. in diameter, canescent-strigose, becoming glabrescent, striate; leaves herbaceous, elliptic-lanceolate, 27–130 mm. long, 9–65 mm. wide, usually acuminate, sometimes acute, mucronate, glabrous above, strigose beneath, becoming glabrescent, entire, attenuate at base, the costa prominulous beneath, with 7 or 8 pairs of lateral veins; petioles 2–6 mm. long, concave above, convex beneath, strigose, articulate; inflorescence paniculate, the axis 8–12 cm. long, 1–2 mm. in diameter, striate, strigose, the lateral branches acute at apex, 4–10 cm. long, 8–10 mm. wide, pedunculate (peduncle 5–15 mm. long), bracteate, the bracts lanceolate-linear, 2.2–3 mm. long, 1–1.5 mm. wide, deciduous, ciliate, 1-nerved, slightly pubescent beneath; flowers 4–4.8 mm. long, the pedicels 0.4–1 mm. long, finely pubescent; outer sepals free, ovate-triangular, acute, rarely more or less obtuse, ciliate, slightly pubescent beneath, the two lower ones 1.4–1.8 mm. long, 1.2–1.4 mm. wide, 5-nerved, the upper sepal 2–2.8 mm. long, 1.8–2 mm. wide, 7-nerved, rarely 5-nerved; wings dark blue, 4–4.8 mm. long, 3.8–4 mm. wide, obovate, obtuse at base, 3-nerved, eciliate, glabrous; keel 4.2–5.2 mm. long, 2–3 mm. wide, orbicular, plicate, pubescent within, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-subemarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 2.8–3.8 mm. long, almost entirely united, the free part 0.5–1 mm. long, glabrous; ovary more or less cylindric, slightly curved, 1.2–1.6 mm. long, 0.6–0.8 mm. wide, glabrous; style 2.2–2.6 mm. long, geniculate above base, glabrous, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe more or less ellipsoid, 5–5.5 mm. long, 2.8–3 mm. wide, the apex acute, glabrous, reticulate.

Distribution: In the southwestern region of Ecuador, between 600 and 1000 meters altitude.

Manabi: Roadsides, coast of Jipijapa, *Haught* 3395 (US).

Guayas: Balao, *Eggers* s.n. (US); Teresita, *Stevens* 50 (US); Guayaquil, *Pavon* s.n. (photograph of type Ch, US).

Chimborazo: Between Bucay and Hacienda Rosa Mercedes, Cordillera Occidental, *Acosta Solís* 5184 (Ch), 5211A (Ch); Bucay, *Rose & Rose* 22443 (GH, NY, US).

Prov. ? : Without locality, *Pavon* s.n. (fragments of authentic material US); *Eggers* 14237 (K), 15045 (K).

Monnina denticulata is related to *M. paniculata* Benth., but is distinct in the glabrescent habit, the acuminate leaves, the panicle with fewer lateral branches, the axis of the inflorescence being shorter (up to 12 cm. long), the flower-subtending bracts being lanceolate-linear, the cylindric ovary, etc.

14. *MONNINA REVOLUTA* H.B.K. Nov. Gen. & Sp. 5: 412. 1821.

Shrub to 2 m. high, the stem erect, glabrescent, branched, the branches 10–42 cm. long, 2–9 mm. in diameter, canescent-strigose, corymbose; leaves crowded, linear-elliptic; more or less coriaceous, 12–36 mm. long, 3.5–7 mm. wide, obtuse, glabrescent above, strigose beneath, becoming glabrescent, entire, conspicuously revolute, the costa prominulous beneath, with inconspicuous lateral veins; petioles 1–2 mm. long, concave above, convex beneath, puberulent; racemes conical, acute, 8–10 mm. wide, simple, terminal, pedunculate (peduncle 5–11 mm. long), the axis 1.6–3.2 cm. long, slightly pubescent, thick (3–5 mm. in diameter), bracteate, the bracts triangular, acute, 1.5–2.2 mm. long, 1.4–2 mm. wide, glabrescent beneath, ciliate, 1-nerved, inconspicuous, deciduous; flowers 4.5–5.5 mm. long, the pedicels 0.6–1 mm. long, finely pubescent; outer sepals free, ovate-triangular, obtuse, ciliate, the two lower ones 2–2.2 mm. long, 1.8–2 mm. wide, rarely inconspicuously united at base, usually 1-nerved, sometimes 3-nerved, the upper sepal 2.4–3 mm. long, 2.5–2.8 mm. wide, 5-nerved; wings 5.5–5.8 mm. long, 5–5.2 mm. wide, obovate, more or less acute at base, 3-nerved, ciliate, glabrous; keel 5.2–6 mm. long, 3–3.2 mm. wide, orbicular, plicate, slightly pubescent within, becoming glabrescent, obtuse at base, 4-nerved, 3-lobed, the middle lobe obtuse-emarginate; upper petals spatulate, pubescent; stamens 8, the filaments 3.5–4.2 mm. long, almost entirely united, the free part 0.8–1.4 mm. long, glabrous; ovary ovoid, 1.6–1.8 mm. long, 0.8–1 mm. wide, glabrous; style 2.8–3.2 mm. long, geniculate near its base, glabrous, more or less cylindric; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe elliptic, 6–7.5 mm. long, 3.8–4 mm. wide, glabrous, reticulate.

Distribution: Andean region of southern Ecuador, between 3810 and 3930 meters altitude. Also in the central and southern Andes of Colombia.

Pichincha: Without locality, *Jameson* s.n. (K).

Azuay: Páramos, in vicinity of Toreador, between Molleduro and Quinoas, *Steyermark* 53046 (Ch, US).

This species is distinguished by having linear, coriaceous, revolute, decurrent leaves, and in having the axis of the racemes conspicuously thick (up to 5 mm. in diameter). It is a relative of *M. crassifolia* H. B.K., but is distinct chiefly in its conspicuously linear-elliptic leaves, the thick axis of the racemes, and in its $\frac{1}{2}$ united lower sepals. *Monnina revoluta* is typified by a collection from Pasto, Department of Nariño, Colombia, of which fragments and photographs are available.

15. *MONNINA PTEROCARPA* R. & P. Syst. Veg. 174. 1798; Chodat in Bull. Herb. Boiss. **2**: 168. 1894; in Engl. Bot. Jahrb. **42**: 102. 1908; Ferreyra in Journ. Arn. Arb. **27**: 132. 1946.

Monnina chanduyensis Chodat in Bull. Herb. Boiss. **2**: 167. 1894.

Herbaceous, 4.3–4.8 dm. high; stem 2–3 mm. in diameter, erect, terete, canescent-strigose, becoming glabrescent, branched, the branches 13–17 cm. long, canescent-strigose, striate; leaves lanceolate, 21–60 mm. long, 6–18 mm. wide, acute, slightly mucronate, glabrescent above, strigose beneath, entire, attenuate at base, the costa prominulous beneath, with 5 or 6 pairs of lateral veins; petioles 1–1.5 mm. long, concave above, convex beneath, strigose; racemes more or less conical, acute, 7–10 mm. wide, simple, terminal, pedunculate (peduncle 6–15 mm. long), the axis 1.8–15.5 cm. long, strigose, striate, bracteate, the bracts linear, 3–3.5 mm. long, 0.6–0.8 mm. wide, deciduous, ciliate, 1-nerved; flowers 4–4.4 mm. long, the pedicels 1–1.2 mm. long, glabrous; outer sepals free, lanceolate, concave, ciliate, acute, finely pubescent beneath, the two lower ones 2–2.2 mm. long, 0.8–1 mm. wide, 3-nerved, the upper sepal 2.8–3 mm. long, 1–1.1 mm. wide, 5-nerved; wings 4–4.2 mm. long, 3.8–4 mm. wide, obovate, acute at base, 3-nerved, glabrous; keel 4.2–4.6 mm. long, 3–3.2 mm. wide, more or less orbicular, plicate, glabrous within, obtuse at base, 3-nerved, conspicuously 3-lobed, the middle lobe obtuse-emarginate, larger; upper petals elongate, slightly pubescent; stamens 8, the filaments 3–3.2 mm. long, united almost throughout, the anthers emarginate; ovary elliptic, 1.8–2 mm. long, 1–1.2 mm. wide, glabrous; style 2.2–2.4 mm. long, geniculate near its base, glabrous, the apex 4–5 times as wide as the base, 2-auricled, the auricles almost inconspicuous; stigma with 2 lobes, the lower one more or less acute, the upper 2-tubercled; samara ovate, 4.8–6.2 mm. long, 4–4.8 mm. wide, gray-strigillose, becoming glabrescent, the wing 1–1.5 mm. wide, membranaceous, deeply emarginate at apex and base, the body rugose-reticulate.

Distribution: Southwestern part of Ecuador and northern and central Peru.

Guayas: Punta Centinela, *Svenson* 11390 (GH, NY); Chanduy, *Spruce* 6398 (type photograph of *Monnina chanduyensis* Ch.).

This species is characterized by its herbaceous habit, by its style being 2-auricled and conspicuously thickened toward apex (the apex up to 5 times as wide as the base), and by its fruit being a samara deeply emarginate at apex. The Peruvian distribution of the species was discussed by me in 1946, at which time the identity of *M. chanduyensis* with *M. pterocarpa* was pointed out.

16. *MONNINA ANDREANA* Chodat in Bull. Herb. Boiss. **3**: 134. 1895.

Shrub, branched, the branches 1.5–4 mm. in diameter, hirsute, striate; leaves lanceolate, 42–70 mm. long, 11–21 mm. wide, acute, canescent-hirsute, entire, attenuate at base, the costa prominulous beneath, with 5 or 6 pairs of lateral veins; petioles 3–5 mm. long, concave above, convex beneath, canescent-hirsute; racemes elongate, acute, 8–9 mm. wide, simple, terminal or axillary, pedunculate (peduncle 5–16 mm. long), the axis 4–7.5 cm. long, 1–1.5 mm. in diameter, striate, hirsute, bracteate, the bracts acute-triangular, hood-shaped at base, deciduous, ciliate, 1-nerved, pubescent beneath, inconspicuous; flowers 4–4.5 mm.

long, the pedicels 1–1.2 mm. long, finely pubescent; outer sepals free, ovate-triangular, obtuse, ciliate, slightly pubescent beneath, the two lower ones 1–1.2 mm. long, 0.8–1 mm. wide, 3-nerved, the upper sepal 1.4–1.8 mm. long, 1–1.2 mm. wide, 5-nerved; wings blue, 3.8–4.2 mm. long, 2.6–3 mm. wide, obovate, acute at base, 3-nerved, pubescent above and beneath, conspicuously ciliate; keel 4–4.6 mm. long, 2–2.8 mm. wide, orbicular, plicate, pubescent within, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-subemarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 2.8–3 mm. long, almost entirely united, the free part 0.5–1 mm. long, glabrous; ovary ovoid, 1.2–1.4 mm. long, 0.8–1 mm. wide, pubescent; style 2–2.4 mm. long, geniculate above base, glabrous, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 4–4.5 mm. long, 2.8–3 mm. wide, conspicuously canescent-pubescent, reticulate.

Distribution: Northern Andes of Ecuador, between 1800 and 2430 meters altitude; also in southern Colombia.

Pichincha: Saloya, *Acosta Solís* 5846 (Ch); along Río Saloya, between Volcán Atacaso and Volcán Pichincha, *Steyermark* 52473 (Ch, US); Guaruma, km. 38 along Río Saloya, *Acosta Solís* 11017 (Ch).

Province?: "In Andibus Ecuadorensibus," *Spruce* 4974 (Ch, GH, K, NY).

Monnina andreana is distinguished by its conspicuously hirsute habit, its lanceolate leaves, its triangular, inconspicuous flower-subtending bracts, and its densely pubescent ovary. From *M. elongata* Pl. & Lind., a close Colombian relative, it differs in having conspicuously hirsute branches, acute leaves with 5 or 6 pairs of lateral veins, racemes with a shorter axis (to 7.5 cm. long), etc. The type of *M. andreana* is *Lehmann* 2129, from the Department of Cauca, Colombia. Through the kindness of Prof. Charles Baehni, Director of the Conservatoire Botanique, Genève, I have been able to examine this type and to verify the identity of the Ecuadorean specimens.

17. MONNINA CHIMBORAZOANA Chodat in Bull. Herb. Boiss. **4**: 247, as *M. chimborazoana*. 1896.

Shrub, 3–5 m. high, branched, the branches 3–5 mm. in diameter, hirsute, striate; leaves ovate-elliptic, sometimes more or less lanceolate, 50–115 mm. long, 20–45 mm. wide, acuminate, mucronate, slightly canescent-pubescent, becoming glabrescent, entire, attenuate at base, the costa prominulous beneath, with 7 or 8 pairs of lateral veins; petioles 4–6 mm. long, concave above, convex beneath, hirsute; racemes conical, acute, 8–10 mm. wide, simple, terminal or axillary, pedunculate (peduncle 6–24 mm. long), the axis 2.2–10 cm. long, hirsute, striate, bracteate, the bracts linear, more or less hood-shaped at base, 1.8–2 mm. long, 0.7–0.9 mm. wide, deciduous, ciliate, 1-nerved, pubescent beneath; flowers 4–4.4 mm. long, the pedicels 1.4–1.6 mm. long, finely pubescent; outer sepals free, ovate-triangular, obtuse, ciliate, slightly pubescent beneath, the two lower ones 1.8–2 mm. long, 0.8–1 mm. wide, 1-nerved, sometimes 3-nerved, the upper sepal 2.4–2.6 mm. long, 1–1.2 mm. wide, 5-nerved, the nerves inconspicuous; wings 4–4.5 mm. long, 3.5–3.6 mm. wide, obovate, acute at base, 3-nerved, slightly pubescent beneath, ciliate; keel 4–4.5 mm. long, 2.4–2.8 mm. wide, orbicular, plicate,

pubescent within, becoming glabrescent, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse, inconspicuous, subemarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3–3.5 mm. long, almost entirely united, the free part 0.5–1 mm. long, glabrous; ovary ovoid, 1–1.5 mm. long, 0.8–1 mm. wide, slightly pubescent, becoming glabrescent; style 2.6–2.8 mm. long, geniculate above base, pubescent, becoming glabrescent, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 5.5–7 mm. long, 3.5–4 mm. wide, pubescent, becoming glabrescent, reticulate.

Distribution: Central Andes of Ecuador, between 1200 and 3000 meters altitude.

Tungurahua: Mountainside south of Baños, *Penland & Summers* 98 (Ch, NY); Hacienda San Antonio, near Baños, *H. Sydow* 662 (US); between Leito and La Cima, Cordillera Oriental, *Acosta Solís* 8992 (Ch).

Chimborazo: Vicinity of Huigra, mostly on the Hacienda de Licay, *Rose & Rose* 22302 (GH, NY, US); Cañón of the Río Chanchán, near Huigra, *Camp* 3018 (NY); north of Huigra, *Camp* 3292 (NY); between Santa Rosa and Joyagshi, near Tipococha, *Camp* 4117 (NY).

Cañar: Between Tambo and Suscal, *Camp* E-2761 (NY).

Azuay: Valley of the Río Girón, *Camp* E-2190 (NY), E-2192 (NY); Nudo de Portete, between ríos Tarquí and Girón, *Camp* 2162 (NY); vicinity of the lake in the valley of the Río Surucuchu, west of Cuenca, *Camp* E-4177 (NY).

Province?: "In Andibus Ecuadorensibus", *Spruce* 5973 (K).

This species is near *M. andreana* Chodat, but unlike that species, it has ovate-elliptic, larger, and mucronate leaves (up to 115 x 45 mm.), its flower-subsutending bracts linear, conspicuous (up to 2 mm. long), its ovary slightly pubescent or glabrescent, and its drupe larger (up to 7 mm. long). The type of *M. chimborazoana* is an unnumbered Spruce collection from Mt. Chimborazo. It is possible that the specimen of *Spruce* 5973 cited above is an isotype.

18. *MONNINA DECURRENS* Ferreyra in Journ. Arn. Arb. **27**: 160. 1946.

Frutescent, to 1 m. high, branched, the branches 10–18 cm. long, 1.5–6 mm. in diameter, slightly canescent-pubescent, striate; leaves elliptic, 11–22 mm. long, 6–10 mm. wide, coriaceous, obtuse, strigose, entire, obtuse at base, revolute, the costa prominulous beneath, with inconspicuous lateral veins; petioles 1–1.5 mm. long, pubescent; racemes conical, acute at apex, 9–10 mm. wide, simple, terminal, subsessile, the axis 1–2.5 cm. long, canescent-pubescent, striate, bracteate, the bracts triangular, acute, 1–1.2 mm. long, 0.9–1 mm. wide, ciliate, deciduous, pubescent beneath, 1-nerved, inconspicuous; flowers 4.2–5 mm. long, the pedicels 0.8–1 mm. long, finely pubescent; outer sepals free, triangular, obtuse, ciliate, finely pubescent beneath, becoming glabrescent, the two lower ones 1.8–2.5 mm. long, 2–2.8 mm. wide, 3-nerved, the upper sepal 2.2–2.8 mm. long, 2.8–3 mm. wide, 5-nerved; wings 4.8–5.2 mm. long, 4.2–4.6 mm. wide, obovate, obtuse at base, 3-nerved, ciliate; keel 4.8–5.2 mm. long, 2.8–3 mm. wide, orbicular, plicate, pubescent within, obtuse at base, 3-nerved, inconspicuously 3-lobed; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3.2–3.8 mm. long, almost entirely united, the free part 0.5–1.2 mm. long, glabrous;

ovary ovoid, 1–1.6 mm. long, 0.8–1 mm. wide, pubescent; style 2–2.2 mm. long, slightly geniculate near its base, thicker toward apex; stigma with 2 lobes, the lower one more or less acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 6–8.5 mm. long, 3.8–5 mm. wide, pubescent, becoming more or less glabrescent, reticulate.

Distribution: Andes of southern Ecuador, between 2400 and 3360 meters altitude; also in the Andean region of northern Peru.

Azuay: Between Oña and Río Yacuambi, Eastern Cordillera, *F. Prieto* 290 (NY).

This species is closely related to *M. loxensis* Benth., from which it differs in its revolute leaves, its conspicuously pubescent wings, its densely pubescent style, etc. The type is *Weberbauer* 6100, from Cajamarca, Peru.

19. *MONNINA LOXENSIS* Benth. Pl. Hartw. 125. 1844.

Frutescent, to 2 m. high, branched, the branches 1.2–5 mm. in diameter, canescent-strigose, becoming glabrescent, striate; leaves elliptic, 13–75 mm. long, 6–24 mm. wide, obtuse, glabrescent above, canescent-strigose beneath, entire, slightly revolute, attenuate at base, the costa prominent beneath, with inconspicuous lateral veins; petioles 1–4 mm. long, concave above, convex beneath, articulate, strigose; racemes conical, acute, 7–8 mm. wide, simple, terminal, pedunculate (peduncle 2–5 mm. long), the axis 1.5–3.2 cm. long, strigose, striate, bracteate, the bracts triangular, acute, 1.2–1.5 mm. long, 1–1.2 mm. wide, deciduous, ciliate, 1-nerved, finely pubescent beneath, becoming glabrescent; flowers 3.6–4.8 mm. long, the pedicels 1–1.8 mm. long, finely pubescent; outer sepals free, ovate-triangular, obtuse, ciliate, slightly pubescent beneath, the two lower ones 1.6–1.8 mm. long, 1–1.6 mm. wide, 3-nerved, rarely 2-nerved, the upper sepal 1.8–2.4 mm. long, 1.4–1.6 mm. wide, 5-nerved; wings 4–5 mm. long, 3.6–3.8 mm. wide, obovate, obtuse at base, 3-nerved, ciliate, sometimes slightly pubescent beneath; keel 4–5 mm. long, 2.8–3.2 mm. wide, orbicular, plicate, pubescent within, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse, subemarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 2.8–3.4 mm. long, almost entirely united, the free part 0.5–1 mm. long, glabrous; ovary ovoid, 1.2–2 mm. long, 0.7–1 mm. wide, completely pubescent; style 2.2–2.6 mm. long, geniculate above base, glabrous, rarely with a few hairs at base, more or less cylindric; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 5–6.2 mm. long, 3–3.2 mm. wide, pubescent, reticulate.

Distribution: Southern Andes of Ecuador, between 2000 and 3290 meters altitude.

Azuay: East of El Pan, Cordillera Oriental, *Acosta Solís* 5088 (Ch); south of El Pan, slopes bordering Río Collay, *Steyermark* 53357 (Ch, US); between El Pan and Guachapala, *Camp* 5250 (NY); Páramo del Castillo, between Sevilla de Oro and Méndez, *Camp* 5110 (NY).

Loja: Between Loja and Portovelo, *Rose, Pachano & Rose* 23369 (NY, US); "In montibus Loxa", *Hartweg* 714 (fragments of type Ch, US; photographs of type Ch, US); around Tambo Cachiyacu, western slopes of Cordillera de Cóndor, about 2 leagues southeast of Yangana, *Steyermark* 54813 (Ch, US); Cariamanga, *Townsend* A31 (US).

The small, elliptic leaves with inconspicuous lateral veins, the free outer sepals, and the densely pubescent ovary characterize this species.

20. *MONNINA OBOVATA* Chodat & Sodiro in Engl. Bot. Jahrb. **36**: 379. 1905.

Shrub 2–2.5 m. high, branched, the branches 2.5–6 mm. in diameter, canescent-hirsute, becoming glabrescent, striate, conspicuously corymbose; leaves ovate or spatulate, 22–45 mm. long, 14–24 mm. wide, obtuse, sometimes subemarginate, rarely submucronate, strigose above, slightly canescent-hirsute beneath, entire, attenuate at base, the costa prominulous beneath, with 5 or 6 pairs of lateral veins; petioles 1.5–3 mm. long, concave above, convex beneath, hirsute; racemes conical, acute, 8–10 mm. wide, simple, terminal, pedunculate (peduncle 3–9 mm. long), the axis 3–5 cm. long, canescent-hirsute, striate, bracteate, the bracts triangular, acute, hood-shaped at base, 2–2.2 mm. long, 1–1.2 mm. wide, deciduous, ciliate, 1-nerved, pubescent beneath; flowers 4.2–5 mm. long, the pedicels 0.8–1.2 mm. long, finely pubescent; outer sepals free, ovate-triangular, obtuse, ciliate, finely pubescent beneath, the two lower ones 2–2.2 mm. long, 1–1.4 mm. wide, 1-nerved, the upper sepal 2.6–2.8 mm. long, 1.6–1.8 mm. wide, 3-nerved, wings 4.6–4.8 mm. long, 4–4.2 mm. wide, obovate, obtuse at base, 3-nerved, ciliate, slightly pubescent within near base; keel 4.8–5 mm. long, 3–3.2 mm. wide, orbicular, plicate, slightly pubescent within, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-subemarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3–3.2 mm. long, almost entirely united, the free part 0.5–1 mm. long, glabrous; ovary ovoid, 1–1.2 mm. long, 0.9–1 mm. wide, glabrous; style 2.2–2.5 mm. long, geniculate above base, glabrous, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 5–6 mm. long, 3–4 mm. wide, glabrous, reticulate.

Distribution: Central Andes of Ecuador, between 2000 and 3000 meters altitude.

Chimborazo: "M. Chimborazo", *Sodiro* 95 (photographs of type Ch. US).

Cañar: Between Tambo and Suscal, valley of Río Cañar, *Camp* E-2763 (NY).

Azuay: 90 km. south of Cuenca on northern side of valley of Río León, *Wiggins* 10829 (NY).

This species is characterized by its conspicuous, hirsute, crowded, and corymbose upper branches, its obovate leaves, etc. It is closely related to *M. salicifolia* R. & P., from which it differs in the characters mentioned.

21. *MONNINA ANGUSTATA* Tr. & Pl. in Ann. Sci. Nat. IV. **17**: 140. 1862.

Frutescent, to 1.5 m. high, branched, the branches 2–5 mm. in diameter, conspicuously canescent-hirsute, becoming glabrescent, striate; leaves narrowly lanceolate, 30–90 mm. long, 9–30 mm. wide, acuminate, rarely acute, slightly pubescent, becoming glabrescent, entire, attenuate at base, the costa prominulous beneath, with 8 or 9 pairs of lateral veins; petioles 1.6–4 mm. long, concave above, convex beneath, pubescent; racemes elongate, acuminate, 9–10 mm. wide,

simple, terminal or axillary, pedunculate (peduncle 8–26 mm. long), the axis 4.5–21 cm. long, canescent-hirsute, striate, bracteate, the bracts linear-lanceolate, acuminate, 4–5 mm. long, 1.2–1.4 mm. wide, deciduous, ciliate, 1-nerved, canescent-pubescent beneath; flowers 4.8–5.2 mm. long, the pedicels 1–1.5 mm. long, finely pubescent; outer sepals free, triangular, acute, ciliate, finely pubescent beneath, the two lower ones 2.2–2.5 mm. long, 1.9–2 mm. wide, 3-nerved, the upper sepal 2.8–3 mm. long, 2.2–2.6 mm. wide, 5-nerved; wings 5–5.2 mm. long, 4–4.2 mm. wide, obovate, obtuse at base, 3-nerved, glabrous, eciliate; keel 5.2–5.5 mm. long, 3.6–3.8 mm. wide, orbicular, plicate, pubescent within, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-subemarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3.6–3.8 mm. long, almost entirely united, the free part 0.6–1 mm. long, glabrous; ovary ovoid, 1.8–2 mm. long, 1–1.2 mm. wide, glabrous; style 2.8–3 mm. long, geniculate above base, glabrous, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 5.5–7 mm. long, 2.5–4 mm. wide, glabrous, reticulate.

Distribution: Andean region of southern Ecuador, between 1800 and 3350 meters altitude; also in Colombia.

Chimborazo-Cañar: Between Santa Rosa and Joyagshi, near Tipococha, *Camp* E-4117 (NY).

Azuay: Between Baños and Cuenca, *Acosta Solís* 5146 (Ch); above thermal springs of Baños, *Steyermark* 53276 (Ch); 18–20 km. west of Cuenca, *Camp* E-4117 (NY); Nudo de Portete, *Camp* E-2162 (NY).

From *M. salicifolia* R. & P., its nearest ally, *M. angustata* differs in its narrowly lanceolate and acuminate leaves, its racemes with linear and extrorsely pubescent bracts, its acute-triangular outer sepals, etc.

22. MONNINA SALICIFOLIA R. & P. Syst. Veg. 172. 1798.

Monnina nemorosa H. B. K. Nov. Gen. & Sp. 5: 416. t. 504. 1821.

Shrub, to 2 m. high, branched, the branches 2–5 mm. in diameter, nodose, slightly canescent-pubescent, becoming glabrescent, striate; leaves usually elliptic, rarely more or less lanceolate, 14–65 mm. long, 6–20 mm. wide, obtuse, rarely almost acute, canescent-strigose, becoming glabrescent, entire, slightly revolute, more or less attenuate at base, the costa prominulous beneath, with 5 or 6 pairs of lateral veins; petioles 1–2 mm. long, concave above, convex beneath, articulate, strigose; racemes conical, acute, 8–10 mm. wide, simple, terminal, pedunculate (peduncle 4–16 mm. long), the axis 1–8.5 cm. long, canescent-strigose, striate, bracteate, the bracts acute-triangular, 1.2–2.2 mm. long, 1.4–1.8 mm. wide, deciduous, ciliate, 1-nerved, finely pubescent beneath, becoming glabrescent; flowers 5–5.8 mm. long, the pedicels 0.8–1.2 mm. long, finely pubescent; outer sepals free, ovate-triangular, obtuse, ciliate, slightly pubescent beneath, rarely glabrescent, the two lower ones 1.8–2.2 mm. long, 1.6–1.8 mm. wide, usually 3-nerved, sometimes 5-nerved, the upper sepal 2–2.8 mm. long, 2–2.2 mm. wide, 5- or 7-nerved; wings blue, 5–6 mm. long, 4.5–5.8 mm. wide, obovate, obtuse at base, usually glabrous beneath, sometimes slightly pubescent, 3-nerved, ciliate; keel 5–6 mm. long, 3.5–4 mm. wide, orbicular, plicate, pubescent within, rarely glabrescent, obtuse at base, 3-nerved, 3-lobed, the middle lobe

obtuse-emarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3.6–4 mm. long, almost entirely united, the free part 0.5–1.2 mm. long, glabrous; ovary ovoid, 1.5–2.2 mm. long, 1–1.2 mm. wide, glabrous; style 2.8–3 mm. long, geniculate above base, glabrous, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 5.2–7 mm. long, 2.8–4 mm. wide, glabrous, reticulate.

Distribution: Along the Andes of Ecuador, between 1500 and 3960 meters altitude; also in the Andes of Colombia, Peru, and Bolivia.

El Oro: Between Curtincapa and Guagra Uma, *Steyermark* 53868 (Ch).

Imbabura: Lake Cuicocha, *Penland & Summers* 826 (Ch, NY).

Pichincha: Mt. Pichincha, *Mexia* 6802 (US).

Tungurahua: Between Santa Rosa and Pataló, *Acosta Solís* 9158 (Ch).

Cañar: Near El Tambo, south of Sibambe, *Camp* 2903 (NY); near the village of San Marcos, *Camp* 2484 (NY); Tambo and Suscal, north of the Valley of the Río de Cañar, *Camp* 2786 (NY).

Azuay: On road from Cuenca towards Cumbe, *Haught* 3347 (US); along the Río Cumbe, south of Cuenca, *Camp* 2217 (NY), 2221 (NY); vicinity of Cuenca, *Camp* 2676 (NY); Eastern Cordillera, 1–8 km. north of the village of Sevilla de Oro, *Camp* 4643 (NY); Nudo de Portete, Pass between headwaters of the Ríos Tarqui (Atlantic) and Girón (Pacific), *Camp* 2153 (NY); south of Cuenca, Páramo de Tinajillas, *Camp* 456 (NY); along the Río Tarqui, 4–18 km. south of Cuenca, *Camp* 1846 (NY); Páramo de Tinajillas, 30–50 km. south of Cuenca, *Camp* 2263 (NY).

This common species of Colombia, Ecuador, Peru, and Bolivia is characterized by its glabrescent branches, its elliptic and revolute leaves, its flower-subtending bracts being acute-triangular (up to 2.2 mm. long), etc. The original description, besides the plate and the authentic material of *M. nemorosa* H.B.K., indicates that only one species is concerned.

22a. *MONNINA SALICIFOLIA* var. *PILOSTYLIS* Ferreyra in Jour. Arn. Arb. 27: 158. 1946.

Distinguished from the typical variety by its conspicuously pilose style.

Distribution: Occurring throughout the range of the species in Ecuador; also in Peru.

Carchi: About 5 miles south of Tulcán, *Hitchcock* 21004 (GH, NY, US).

Pichincha: Pass on Quito-Santo Domingo road, *Haught* 3193 (US); Otón, region Interandina, *Acosta Solís* 11271 (Ch); Quito, *Jameson* 236 (K); without locality, *Jameson* 104 (K); west of Quito, *Owenby* 2603 (DA, US); between Tambillo and Aloag, *Fosberg* 22547 (DA, US).

Tungurahua: Between Pasa and San Fernando, *Acosta Solís* 8687 (Ch); vicinity of Ambato, *Rose & Rose* 22347 (GH, NY); Mocha, Ambato, *Sandeman* 76 (K); Catiplata near Ambato, *Pachano* 2 (US).

Chimborazo: Between Pungalá and Alao, *Acosta Solís* 7606 (Ch); Sibambe, *Fosberg & Giler* 22623 (DA, US).

Prov. ? : Carmen, *Tate* 500a (US); Páramo de Ruiz, *Lehmann* 639

(US); "In Andibus Ecuadorensibus", *Spruce* 5084 (Ch, GH, K, NY), 5889 (authentic material of *M. nemorosa* Ch, GH, K, US); "Andium Quitensium", *Jameson* s.n. (US); "Quitensian Andes", *Couthouy* s.n. (NY).

23. *MONNINA CRASSIFOLIA* H.B.K. Nov. Gen. & Sp. 5: 411. 1821.

Shrub to 3 m. high, branched, the branches 1.5–5 mm. in diameter, canescent-hirsute, becoming glabrescent, striate; leaves crowded, more or less coriaceous, linear, 18–55 mm. long, 4–11 mm. wide, obtuse, strigose, becoming glabrescent, entire, revolute, the costa prominulous beneath, with inconspicuous lateral veins, obtuse, or slightly attenuate at base; petioles 1–2.5 mm. long, concave above, convex beneath, canescent-hirsute; racemes conspicuously conical, acute at apex, 9–11 mm. wide, simple, terminal, pedunculate (peduncle 2–7 mm. long), the axis 1.6–2.8 cm. long, canescent-hirsute, bracteate, the bracts triangular, acute, 1.8–2.4 mm. long, 1–1.8 mm. wide, pubescent beneath, ciliate, 1-nerved, deciduous, inconspicuous; flowers 4.6–5.5 mm. long, the pedicels 1–1.6 mm. long, finely pubescent; outer sepals ovate-triangular, obtuse, ciliate, the two lower ones 2.2–2.5 mm. long, 1.4–1.5 mm. wide, $\frac{1}{2}$ united, 2-nerved, sometimes 3-nerved, the upper sepal 2.5–3 mm. long, 2–2.2 mm. wide, 5-nerved; wings 4.8–6 mm. long, 4–5 mm. wide, obovate, acute at base, 3-nerved, ciliate on both sides; keel 5–6 mm. long, 3–3.2 mm. wide, orbicular, plicate, slightly pubescent within, sometimes glabrescent, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-emarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3.5–4.2 mm. long, almost entirely united, the free part 0.5–1.2 mm. long, glabrous; ovary ovoid, 1.2–2 mm. long, 0.9–1.2 mm. wide, glabrous; style 2.2–3 mm. long, geniculate above base, usually glabrous, rarely slightly pubescent, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 3.5–6 mm. long, 1.6–3.5 mm. wide, glabrous, reticulate.

Distribution: Andean region of northern and central Ecuador, between 3300 and 3800 meters altitude.

Pichincha: Pichincha, *Jameson* s.n. (NY), 633 (authentic material Ph, US); near Quito, *Jameson* 63 (fragments, US); Hacienda Chisinche, monte Iliniza, *Hartweg* 904 (fragments of authentic material Ch).

Cotopaxi: Cotopaxi, *Paredes* 1 (Ch), 2 (Ch).

Chimborazo: Bosque Andino de Cubillín, Cordillera Oriental, *Acosta Solís* 7550 (Ch); Páramo de Pinllillic, Cordillera Oriental, *Acosta Solís* 7703 (Ch); Urbina, *Anthony & Tate* 373 (US); Riobamba, Páramo, *Schimpff* 801 (US).

Azuay: Without locality, *Bonpland* s.n. (photographs of type Ch, US).

Prov. ? : "In Andibus Ecuadorensibus", *Spruce* 5508 (NY); without locality, *Rimbach* 145 (Ch, NY).

The species is distinguished by its linear and revolute leaves and by having its lower sepals $\frac{1}{2}$ united.

24. *MONNINA EQUATORIENSIS* Chodat in Bull. Soc. Bot. Genève II. 25: 207. 1934.

Shrub to 6 m. high, branched, the branches 3–4 mm. in diameter, conspicuously hirsute, more or less striate; leaves oblong, 26–135 mm. long, 13–31 mm. wide, subcoriaceous, obtuse, slightly mucronate, pubes-

cent above, becoming glabrescent, canescent-hirsute beneath, entire, revolute, attenuate at base, the costa prominulous beneath, with 6-8 pairs of lateral veins; petioles 1.5-5 mm. long, concave above, convex beneath, hirsute; racemes conical, corymbose, acute at apex, 7-9 mm. wide, simple, terminal or axillary, pedunculate (peduncle 12-15 mm. long), the axis 2.8-5.5 cm. long, hirsute, striate, bracteate, the bracts more or less triangular, acuminate, 1.8-2 mm. long, 0.8-1 mm. wide, deciduous, ciliate, 1-nerved, pubescent beneath, inconspicuous; flowers 4-4.5 mm. long, the pedicels 0.8-1 mm. long, finely pubescent; outer sepals triangular, acute, ciliate, finely pubescent beneath, the two lower ones 2-2.4 mm. long, 1-1.2 mm. wide, one-third united, rarely slightly united, 1-nerved, the upper sepal 2.4-2.6 mm. long, 1.4-1.5 mm. wide, 3-nerved; wings 4-4.5 mm. long, 2.8-3 mm. wide, obovate, obtuse at base, 3-nerved, pubescent beneath, sometimes glabrescent, ciliate; keel 4.2-4.8 mm. long, 2-2.2 mm. wide, orbicular, plicate, pubescent within, slightly pubescent beneath, rarely glabrescent, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-subemarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3-3.2 mm. long, almost entirely united, the free part 0.6-1 mm. long, glabrous; ovary ovoid, 1.4-2 mm. long, 0.6-1 mm. wide, pubescent, the hairs rigid, conspicuous in the upper part; style 1.8-2 mm. long, geniculate near base, glabrous, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 6-6.5 mm. long, 3.5-3.8 mm. wide, pubescent, reticulate.

Distribution: Along the Andes of Ecuador, between 3200 and 3700 meters altitude.

Pichincha: Chaparro de Sebritana, Oriental Section of Haciendas Pedregal and Yanurco, *Acosta Solís* 8300 (Ch).

Tungurahua: Near Páramo of Minza, *Penland & Summers* 340 (Ch, NY); "in silva subandina vulg. Tungurahua", *Sodiño* 91b (photographs of type Ch, US).

Santiago-Zamora: Between Loma de Galápagos and head waters of Río Tintas, *Steyermark* 53504 (Ch, US).

Province?: "In monte Guayrapata", *Spruce* 5871 (fragments of authentic material US).

Monnina equatoriensis resembles *M. myrtoides* Ferreyra & Wurdack, but is quite distinct in its hirsute habit, in the larger and hirsute leaves (to 13.5 cm. long), in the upper sepal being involute at apex, and in the keel being pubescent within. *Monnina lingua* Chodat, another ally, differs in its hirsute branches, its wider and revolute leaves, its pubescent ovary, etc.

25. *Monnina myrtoides* Ferreyra & Wurdack, sp. nov.

Frutex ramosus ad 1.5 m. altus, ramis plus minusve corymbosis 1.5-6 mm. diametro, manifeste viscidis, striatis; foliorum laminis ovatis, 9-28 mm. longis, 7-13 mm. latis, integris et revolutis, basi obtusis, apice obtusis et leviter mucronatis, glabrescentibus, costa subtus prominula, nervis lateralibus inconspicuis; petiolis 0.6-1.5 mm. longis, supra concavis subtus convexis strigosis; racemis conicis simplicibus terminalibus subsessilibus, 8-10 mm. latis, apice acutis, rhachi 8-16 mm. longis striata viscida bracteata, bracteis deltoideis inconspicuis; floribus 4-4.8 mm. longis, pedicellis 1-1.5 mm. longis minute pubes-

centibus; sepalis exterioribus ovato-deltaideis, acutis, ciliatis, subtus minute pubescentibus glabratisque, duobus inferioribus 2-2.2 mm. et 1.4-1.5 mm. latis ad medium connatis, 3-nerviis, sepalo superiore 2.2-3 mm. longo et 1.8-2.2 mm. lato, 5-nervio; alis caeruleis obovatis 4.4-4.8 mm. longis et 4-4.2 mm. latis, basi acutis, 3-nerviis, ciliatis; carina apice lutea, 4.8-5 mm. longa et 2.8-3 mm. lata, orbiculari, plicata, intus glabra, basi obtusa, 3-nervia, inconspicue 3-lobata; petalis superioribus elongato-spathulatis pubescentibus; staminibus 8, filamentis 3.8-4 mm. longis fere ad apicem connatis, parte libera 0.5-1 mm. longa, glabris; ovario ovoideo ubique pubescente 2-2.2 mm. longo et 1.2-1.6 mm. lato; stylo 2.4-2.6 mm. longo subcylindrico, supra basim curvato; stigmatibus bilobato, lobo inferiore plus minusve acuto, superiore 1-tuberculato, tuberculo papilloso; drupa ellipsoidea lateraliter complanata, pubescente demum glabrata, reticulata.

Distribution: Known only from the type collection.

Type in the herbarium of the New York Botanical Garden, collected on the Páramo del Castillo, between Sevilla de Oro and Méndez, Province of Azuay, Ecuador, alt. 2700-3300 meters, August 18, 1945, by W. H. Camp (No. E-4825).

This new species is distinguished by its conspicuously viscid habit and by its ovate, revolute, and mucronate leaves. It resembles *M. equatoriensis* Chodat but is quite distinct in its smaller and glabrescent leaves (to 28 mm. long), in the upper sepal being ascendent, not involute, and in the keel being glabrous within. It is related also to *M. loxensis* Benth., from which it differs in having viscid branches, the lower sepals $\frac{1}{2}$ united, etc.

26. *MONNINA RUPESTRIS* H.B.K. Nov. Gen. & Sp. 5: 415. 1821.

Shrub, branched, the branches 1.2-2 mm. in diameter, strigose, becoming glabrescent, striate; leaves herbaceous, lanceolate, 38-112 mm. long, 6-20 mm. wide, acuminate, strigose, becoming glabrescent, entire, attenuate at base, the costa prominent beneath, with 9-11 pairs of lateral veins; petioles 1.5-3.5 mm. long, slightly winged, concave above, convex beneath, articulate, strigose; racemes more or less conical, acute at apex, 8-10 mm. wide, simple, terminal or axillary, pedunculate (peduncle 18-25 mm. long), the axis 18-22 cm. long, strigose, striate, bracteate, the bracts filiform, 2.5-3 mm. long, 0.6-0.8 mm. wide, deciduous, ciliate, 1-nerved, slightly pubescent beneath; flowers 4-4.5 mm. long, the pedicels 1-1.2 mm. long, finely pubescent; outer sepals ovate-triangular, obtuse, ciliate, glabrescent beneath, the two lower ones 1.4-1.6 mm. long, 1-1.2 mm. wide, $\frac{1}{2}$ united, 3-nerved, the upper sepal 2-2.2 mm. long, 1.5-1.8 mm. wide, 5-nerved; wings blue, 4.6-4.8 mm. long, 4-4.2 mm. wide, obovate, acute at base, 3-nerved, ciliate; keel 4.4-4.8 mm. long, 2.4-2.8 mm. wide, orbicular, plicate, glabrous within, obtuse at base, 3-nerved, 3-lobed, the middle lobe almost inconspicuous, emarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3-3.5 mm. long, almost entirely united, the free part 0.5-1.2 mm. long, glabrous; ovary ovoid, 1.2-1.4 mm. long, 0.9-1 mm. wide, glabrous; style 2.6-2.8 mm. long, geniculate above base, glabrous, slightly thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; fruit drupaceous, glabrous, reticulate.

Distribution: Andean region of Ecuador, between 1000 and 2000 meters altitude; also in central and southern Colombia.

El Oro: Between La Chorita and Portovelo, Gold Mine near Zaruma, *Hitchcock* 21195 (GH, US).

Azuay: "Saraguru", *Bonpland* s.n. (fragments of type US, photograph of type US).

This shrub is characterized by its herbaceous, acuminate leaves, the long axis of its racemes (up to 22 cm. long), its lower sepals being $\frac{1}{2}$ united, its wings being acute at base, etc.

27. *Monnina haughtii* Ferreyra, sp. nov.

Frutex ad 1 m. altus ramosus, ramis striatis 4–5 mm. diametro strigosis glabrescentibus; foliorum laminis lineari-lanceolatis, 38–172 mm. longis, 10–36 mm. latis, integris, basi attenuatis, apice acuminatis interdum subacutis conspicue mucronatis, supra strigosis glabrescentibus, subtus canescenti-strigosis, costa subtus prominula, nervis laterali-bus utrinsecus 10 vel 11; petiolis 3–8 mm. longis, supra concavis subtus convexis, strigosis, leviter alatis; racemis conspicue conicis simplicibus terminalibus vel axillaribus, acuminatis, 15–18 mm. latis; pedunculo 13–22 mm. longo, rhachi 4–13.5 cm. longa canescenti-strigosa striata bracteata, bracteis linearibus, 2.2–2.8 mm. longis, 0.6–0.8 mm. latis, acuminatis, ciliatis, 1-nerviis, subtus leviter pubescentibus glabrescentibus, caducis; floribus 6–7 mm. longis, pedicellis 3–4 mm. longis minute pubescentibus; sepalis exterioribus ovato-deltaeideis, acutis, ciliatis, subtus glabrescentibus, duobus inferioribus 2.2–2.5 mm. longis et 1.4–1.6 mm. latis, ad medium connatis, 3-nerviis, sepalo superiore 3.8–4.2 mm. longo et 2.4–2.8 mm. lato, plerumque 5-nervio, raro 7-nervio; alis caeruleis obovatis 6.2–6.4 mm. longis et 4–4.8 mm. latis, basi obtusii, 3-nerviis, glabris, basim versus ciliatis; carina orbiculari plicata 6.2–7.2 mm. longa et 3.8–4 mm. lata, intus glabra, basi obtusa, 3-nervia, 3-lobata, lobo medio obtuso-subemarginato inconspicuo; petalis superioribus elongato-spathulatis pubescentibus; staminibus 8, filamentis 4.5–5 mm. longis fere ad apicem connatis, parte libera 1–1.5 mm. longa, glabris; ovario ovoideo glabro 1.6–2.2 mm. longo et 1–1.4 mm. lato; stylo 4–4.8 mm. longo glabro subcylindrico, medium versus geniculato; stigmate bilobato, lobo inferiore acuto, superiore 1-tuberculato tuberculo papilloso; drupa (immatura?) ellipsoidea.

Distribution: Known only from the type collection.

Type in the U. S. National Herbarium, No. 1707983, collected on the Quito-Santo Domingo road, Province of Pichincha, Ecuador, alt. 1800 meters, April 1, 1942, by O. Haught (No. 3212).

The proposed species is very closely related to *M. lingua* Chodat, but is distinct in its acuminate, mucronate leaves, its racemes being acuminate and up to 18 mm. wide, its flower-subtending bracts being linear, etc. It is also near *M. phytolaccifolia* H.B.K., from which it differs in having glabrescent branches, acuminate leaves, racemes that are acuminate and thicker (up to 18 mm. wide) etc.

28. *MONNINA LINGUA* Chodat in Bull. Soc. Bot. Genève II. 25: 216. 1934.

Fruticose, to 2 m. high, branched, the branches 1.5–12 mm. in diameter, hirsute, becoming more or less glabrescent, conspicuously

striate; leaves narrowly lanceolate, 46–130 mm. long, 12–24 mm. wide, more or less coriaceous, obtuse, strigose above, becoming glabrescent, canescent-strigose beneath, entire, attenuate at base, the costa prominentulous beneath, with 10–12 pairs of lateral veins; petioles 3–5.5 mm. long, concave above, convex beneath, hirsute; racemes almost conical, acute, 7–9 mm. wide, simple, terminal or axillary, pedunculate (peduncle 6–22 mm. long), the axis 2–6 cm. long, hirsute, striate, bracteate, the bracts acute-triangular, hood-shaped at base, 1.8–2 mm. long, 1.2–1.6 mm. wide, deciduous, ciliate, 1-nerved, canescent-pubescent beneath; flowers 4.5–5.4 mm. long, the pedicels 1.5–1.8 mm. long, finely pubescent; outer sepals ovate-triangular, obtuse, ciliate, canescent-pubescent beneath, the two lower ones 1.4–2 mm. long, 1.2–1.5 mm. wide, $\frac{1}{2}$ or $\frac{1}{2}$ united, 1-nerved, sometimes 2-nerved, the upper sepal 2–2.2 mm. long, 1.6–1.8 mm. wide, 3-nerved, rarely 5-nerved; wings dark blue, 4.8–5 mm. long, 4.6–4.8 mm. wide, obovate, obtuse at base, 3-nerved, slightly pubescent beneath, sometimes glabrescent; keel 4.8–5.6 mm. long, 3.8–4 mm. wide, orbicular, plicate, pubescent within, rarely glabrescent, obtuse at base, 3-nerved, inconspicuously 3-lobed, the middle lobe obtuse-subemarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3.2–4 mm. long, glabrous; ovary ovoid, 2–2.2 mm. long, 1–1.2 mm. wide, glabrous; style 2–2.2 mm. long, geniculate above base, glabrous, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; fruit unknown.

Distribution: Collected only in the central Andean region of Ecuador, between 2400 and 3500 meters altitude.

Chimborazo-Cañar: Between Santa Rosa and Joyagshi, *Camp* 4074 (NY).

Azuay: Between Cuenca and Huigra, *Hitchcock* 21660 (type collection GH, NY, US); Páramo de Tinajillas, 30–50 km. south of Cuenca, *Camp* 2277 (NY); 18–20 km. south of Cuenca, *Camp* 4178 (NY); 1–8 km. north of the village of Sevilla de Oro, *Camp* 4282 (NY); Páramo del Castillo, between Sevilla de Oro and Méndez, *Camp* 4807 (NY).

This fruticose plant is characterized by its narrowly lanceolate, obtuse leaves, with 10–12 pairs of lateral veins, by its outer sepals being obtuse and the lower ones being united, etc. *Monnina phytolaccifolia* H.B.K. is the closest species, but from that *M. lingua* differs in having narrow and lanceolate leaves with more numerous lateral veins (up to 12), its lower sepals 1-nerved, etc.

29. *MONNINA PHYTOLACCIFOLIA* H.B.K. Nov. Gen. & Sp. 5: 419. 1821.

Shrub to 1.5 m. high, branched, the branches 1.5–2.5 mm. in diameter, conspicuously hirsute, becoming glabrescent, striate, leaves lanceolate or elliptic-lanceolate, 50–95 mm. long, 18–35 mm. wide, usually acute, rarely more or less obtuse, slightly hirsute above, becoming glabrescent, canescent-hirsute beneath, entire, attenuate at base, the costa prominentulous beneath, with 7 or 8 pairs of lateral veins; petioles 2–5 mm. long, concave above, convex beneath, hirsute; racemes conical, acute, 8–10 mm. wide, simple, terminal or axillary, pedunculate (peduncle 3–8 mm. long), the axis 2.4–5 cm. long, hirsute, more or less striate, bracteate, the bracts acute-triangular, hood-shaped at base, 2–2.2 mm. long,

0.8–1 mm. wide, deciduous, ciliate, 1-nerved, slightly pubescent beneath; flowers 4–4.2 mm. long, the pedicels 0.8–1 mm. long, pubescent; outer sepals ovate-triangular, obtuse, ciliate, finely pubescent beneath, becoming glabrescent, the two lower ones 1.8–2 mm. long, 1–1.2 mm. wide, slightly united, 3-nerved, the upper sepal 2.4–2.6 mm. long, 1.4–1.6 mm. wide, 5-nerved; wings dark blue, 3.8–4 mm. long, 3–3.2 mm. wide, obovate, obtuse at base, 3-nerved, finely pubescent beneath, ciliate; keel 4–4.2 mm. long, 2.8–3 mm. wide, orbicular, plicate, glabrescent within, obtuse at base, 3-nerved, 3-lobed, the middle lobe obtuse-emarginate, larger; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3–3.2 mm. long, almost entirely united, the free part 0.5–1 mm. long, glabrous; ovary ovoid, 1–1.4 mm. long, 0.8–1 mm. wide, glabrous; style 2–2.2 mm. long, geniculate above base, with a few hairs, thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid.

Distribution: Northern Andes of Ecuador, at about 1900 meters altitude; also in Colombia.

Chimborazo: Sibambe, *Haught* 3322 (US).

This species is closely related to *M. rupestris* H.B.K., from which it is distinct in the more or less coriaceous and acute leaves, the triangular flower-subtending bracts, the two lower sepals being slightly united at base, etc. The type of *M. phytolaccifolia* was obtained by Bonpland in the present Department of Tolima, Colombia. Fragments and photographs have been examined in connection with the Ecuadorean specimen.

30. *MONNINA OBTUSIFOLIA* H.B.K. Nov. Gen. & Sp. 5: 411. 1821.

Shrub to 3 m. high, branched, the branches 1.5–5.5 mm. in diameter, slightly pubescent, becoming glabrescent, striate; leaves oblong, 15–100 mm. long, 5–24 mm. wide, obtuse, rarely more or less acute, mucronate, strigose, becoming glabrescent, entire, revolute, coriaceous, almost attenuate at base, the costa prominulous beneath, with 6–8 pairs of inconspicuous lateral veins; petioles 1–3 mm. long, slightly concave above, convex beneath, strigose; racemes conical, acute, 8–10 mm. wide, simple, terminal or axillary, pedunculate (peduncle 3–10 mm. long), the axis 1–11 cm. long, strigose, striate, bracteate, the bracts triangular, acute, 1.2–2.2 mm. long, 1.3–1.5 mm. wide, deciduous, ciliate, 1-nerved, finely pubescent beneath, inconspicuous; flowers 4.6–6 mm. long, the pedicels 0.6–1.5 mm. long, finely pubescent; outer sepals ovate-triangular, obtuse, ciliate, slightly pubescent beneath, becoming glabrescent, the two lower ones 2–2.4 mm. long, 1.3–1.5 mm. wide, $\frac{1}{2}$ rarely $\frac{1}{3}$ united, 3-nerved, sometimes 5-nerved, the upper sepal 2.2–3 mm. long, 2–2.5 mm. wide, 5-nerved, rarely 7-nerved; wings blue, 5.8–6 mm. long, 4.2–5 mm. wide, obovate, almost acute at base, 3-nerved, glabrous, sometimes slightly pubescent beneath, ciliate; keel 5.5–6 mm. long, 3–4 mm. wide, orbicular, plicate, pubescent within, rarely glabrescent, more or less acute at base, 3-nerved, 3-lobed, the middle lobe inconspicuous, subemarginate; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 3.8–4.2 mm. long, almost entirely united, the free part 1–1.4 mm. long, pubescent, sometimes glabrescent; ovary ovoid, 1.5–2 mm. long, 1–1.2 mm. wide, glabrous; style 2.2–3 mm. long, geniculate above base, pubescent, more or less cylindric; stigma with

2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 5–7 mm. long, 3–4 mm. wide, glabrous, reticulate.

Distribution: Andean region of Ecuador, between 2400 and 3800 meters altitude. It has been found also in southwestern Colombia.

Carchi: Near Angel, *Mexia* 7444 (NY, US), 7445 (NY, US); between Paja Blanca and El Cucho, *Acosta Solís* 10510 (Ch).

Imbabura: Cuicocha, *Acosta Solís* 11349 (Ch).

Pichincha: Chillo Valley, Santa Rosa, *Anthony* 208 (US); Antisanilla, *Anthony* 348 (US); road between La Magdalena and Lloa, *Firmin* 10 (US); Chilibulo, *Firmin* 615 (Ch); Huairapungo Pass, *Firmin* 488 (US); vicinity of Quito, *Paredes* s.n. (Ch); Chimbacalle, near Quito, *Acosta Solís* 10085 (Ch), 10137 (Ch).

Tungurahua: Páramo de Minza, trail to Minza Grande, *Penland & Summers* 322 (Ch, NY); from Cunchibamba to Tangaleo, *Acosta Solís* 8592 (Ch).

Bolívar: Hacienda Talahua, *Penland & Summers* 579 (Ch, NY).

Chimborazo: Riobamba, Interandean highland, *Rimbach* 170 (NY, US).

Azuay: Eastern Cordillera, between Oña and the Río Yacuambi, *F. Prieto* P-289 (NY), 291 (NY).

Prov. ? : Eastern Cordillera, *Rimbach* 50 (Ch).

This species is characterized by its oblong, obtuse, mucronate, and revolute leaves; the flower-subtending bracts are triangular and inconspicuous, and the style is pubescent. It is closely related to *M. salicifolia* R. & P., from which it differs mainly in its united lower sepals. *Monnina crassifolia* H.B.K. is another close relative, from which *M. obtusifolia* differs in having conspicuously oblong, mucronate leaves, with 6–8 pairs of lateral veins, and a pubescent style. *Monnina obtusifolia* is typified by a Bonpland specimen from the Department of Cauca, Colombia, of which a photograph has been examined.

31. *Monnina pseudo-aestuans* Ferreyra & Wurdack, sp. nov.

Frutex ramosus, ramis striatis 1.5–4 mm. diametro canescenti-hirsutis; foliorum laminis coriaceis glabris ellipticis, 9–15 mm. longis, 6–9 mm. latis, integris revolutisque, utroque obtusis, costa subtus prominula, nervis lateralibus inconspicuis; petiolis 1–1.5 mm. longis paullo hirsutis; racemis conicis simplicibus terminalibus subsessilibus, acutis, 10–11 mm. latis, rhachi 0.8–1.4 cm. longa striata canescenti-hirsuta bracteata, bracteis acuto-deltoides 0.8–1 mm. longis latisque, ciliatis, 1-nerviis, subtus leviter pubescentibus, caducis; floribus 5.2–6 mm. longis, pedicellis 1–1.2 mm. longis minute pubescentibus; sepalis exterioribus ovato-deltoides, obtusis, ciliatis, subtus glabris, duobus inferioribus 2–2.2 mm. longis et 1.1–1.2 mm. latis ad $\frac{2}{3}$ connatis 3-nerviis, sepalo superiore 2.8–3 mm. longo et 2–2.2 mm. lato 5 (interdum 3)-nervio; alis obovatis 5.2–6 mm. longis et 4.8–5 mm. latis, basi obtusis, 3-nerviis, ciliatis; carina orbiculari plicata 5.5–6 mm. longa et 2.7–2.8 mm. lata, intus glabra, basi obtusa, 3-nervia, 2-lobata; petalis superioribus elongato-spathulatis pubescentibus; staminibus 8, filamentis 4.2–4.8 mm. longis fere ad apicem connatis, part libera 0.5–1 mm. longa, glabris; ovario ovoideo glabro 1.6–2 mm. longo et 1.2–1.5 mm. lato; stylo 2–2.2 mm. longo, basim versus leviter geniculato, superne incrassato; stigmate bilobato, lobo inferiore subacuto, superiore conspicue elongato 1-tuberculato, tuberculo papilloso; drupa ellipsoidea

plus minusve complanata 6.2–7.5 mm. longa et 4.2–5 mm. lata, glabra, reticulata.

Distribution: Known only from the type collection.

Type in the herbarium of the New York Botanical Garden, collected on the Páramo del Castillo, between Sevilla de Oro and Méndez, Eastern Cordillera, Province of Azuay, Ecuador, altitude 3300–3390 meters, August 21, 1945, by W. H. Camp (No. E-4866).

This new species is closely related to *M. aestuans* (L.f.) DC., from which it differs in its conspicuously hirsute branches, its glabrous leaves, its keel being 2-lobed, its style being strongly thickened toward apex, with the upper lobe conspicuously elongate, etc.

32. *MONNINA AESTUANS* (L.f.) DC. Prodr. 1: 338. 1824.

Polygala aestuans L. f. Suppl. 315. 1781.

Shrub, to 2 m. high, branched, the branches 7–11 mm. in diameter, strigose, becoming glabrescent, striate; leaves elliptic, 8–14 mm. long, 4–6 mm. wide, coriaceous, obtuse, strigose, becoming glabrescent, entire, obtuse at base, slightly revolute, the costa prominulous beneath, with inconspicuous lateral veins; petioles 1–1.5 mm. long, strigose; racemes conical, acute, 7–9 mm. wide, simple, terminal or axillary, subsessile, the axis 0.8–1 cm. long, strigose, striate, bracteate, the bracts acute-triangular, 2–3.5 mm. long, 1.8–2.2 mm. wide, deciduous, ciliate, 1-nerved, hood-shaped at base, pubescent beneath, inconspicuous; flowers 4.5–5 mm. long, the pedicels 0.8–1.2 mm. long, finely pubescent; outer sepals ovate-triangular, obtuse, ciliate, finely pubescent beneath, the two lower ones 2–2.2 mm. long, 1.4–1.5 mm. wide, $\frac{1}{2}$ united, 3-nerved, the upper sepal 2.2–2.6 mm. long, 1.8–2 mm. wide, 5-nerved; wings 5–5.8 mm. long, 4.8–5 mm. wide, obovate, obtuse at base, 3-nerved, ciliate; keel 5.8–6 mm. long, 2.8–3 mm. wide, orbicular, plicate, glabrous within, obtuse at base, 3-nerved, inconspicuously 3-lobed; upper petals elongate-spatulate, pubescent; stamens 8, the filaments 4.5–4.8 mm. long, almost entirely united, the free part 0.8–1.2 mm. long, glabrous; ovary ovoid, 1.5–2 mm. long, 1–1.2 mm. wide, glabrous; style 2.8–3 mm. long, geniculate above base, glabrous, slightly thicker toward apex; stigma with 2 lobes, the lower one acute, the upper 1-tubercled, the tubercle papillose; drupe ellipsoid, 6–7.5 mm. long, 4–5 mm. wide, glabrous, reticulate.

Distribution: Andean region of Ecuador, between 2400 and 3930 meters altitude; also in the Andes of Colombia.

Pichincha-Imbabura: Nudo de Cajas, Region Interandina, *Acosta Solts* 10366 (Ch).

Cotopaxi: Hacienda Sumbagua, *Haught* 2935 (US).

Azuay: Vicinity of Toreador, páramos between Molleduro and Quinoas, *Steyermark* 53044 (Ch, US); Eastern Cordillera, 1–8 km. north of the village of Sevilla de Oro, *Camp* E-4278 (NY); 6–8 km. northeast of Sevilla de Oro, *Camp* E-5148 (NY); Nabon, *Rose & Rose* 23910 (US); 68 km. south of Cuenca, *Wiggins* 10806 (NY); Cruz Pamba, above Baños, 15 km. southwest of Cuenca, *Camp* E-3941 (NY).

This shrub is characterized by its glabrescent branches, its elliptic, coriaceous, obtuse, revolute leaves, its acute-triangular flower-subtending bracts, and its glabrous style and ovary. Fragments of the type, collected by *Mutis* probably in the Department of Cundinamarca, Colombia, have been examined in connection with this study.

Snakes and Lizards from Quintana Roo, México

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Quintana Roo, a territory of the Estados Unidos de México, occupies the eastern half of the Yucatán Peninsula. It has been and still is *terra incognita* herpetologically, due primarily to its inaccessibility. Since there are no large cities in the territory and it is not traversed by any major highways or railroads, collectors have avoided it, with few exceptions. It is only in recent times that it has been recognized as a political unit, however, and it is true that a certain amount of information concerning it is hidden in publications dealing with Yucatán. A check list of the species known from the territory prior to this study can be found in Smith and Taylor (1945, p. 212, and 1950, p. 225).

A collection of reptiles sent to the University of Michigan by Mauro Cárdenas Figueroa, of the Instituto Polytechnico de México, represents a sizable contribution to our knowledge of the herpetofauna of the territory. Although the collection is small, it contains a surprising number of valuable specimens. It contains twenty-three species, fifteen of which have not been reported as part of the fauna of the territory previously. One species, *Aristelliger georgeensis*, is added to the mainland fauna of México.

All of the specimens were collected in the immediate vicinity of Felipe Carrillo Puerto, which has also been known as Santa Cruz de Bravo. This city is located in the tropical rain forest a little east of the center of the state. Sr. Cárdenas Figueroa states (in litt.) that the flora of the region is dominated by *Achras zapota*, *Swietenia*, *Brosimum*, *Bursera*, *Ceiba*, *Sideroxylon*, *Castilloa*, *Cedrella*, and *Lonchocarpus*. There is an abundance of lianas and epiphytic plants. Unfortunately, no ecological data for the reptiles were furnished.

The species in the following lists are alphabetically arranged. The numbers are tentatively assigned until final disposition of the specimens is made.

SNAKES

Bothrops atrox asper (Garman), 1781, 1784, 1790-91, 1798, 3170. This species, not listed in Smith and Taylor's Checklist (1945, p. sp. 212) as known from Quintana Roo, has been reported from there by Morfín (1918), according to a later note by Smith and Taylor (1950, p. 225). I have not seen Morfín's paper, but the specimens are said to be from "between Payo Obispo and Champoton." Specimens recorded in this extremely vague manner might equally well have originated in Campeche. Morfín also added *Constrictor constrictor imperator* to the fauna of the territory.

Dipsas brevifacies (Cope), 1788, 3192. This species, restricted in its distribution to the Yucatán Peninsula, possesses a uniform color pattern, but is very irregular in its scalation. This variability is most strongly expressed in the loreal region, and is discussed more fully elsewhere (Peters, 1952). This variability is ascribed to the apparent youth of the species, which has probably developed since the recessions of the flood waters that covered the peninsula during late Pliocene and early Pleistocene. It is likely that the species is in a state of evolutionary flux, and will eventually reach equilibrium with a very reduced number of scales in the loreal region. The two specimens examined are females. The scutellation is as follows (with 1788 first in each case): ventrals 167, 173; subcaudals 81, 80; preoculars 0-1, 0-0; suboculars 2-1, 1-1; postoculars 3-3, 3-4; lower labials 12-12, 10-11; body blotches 13, 11; and tail blotches 6, 6. Both have nine upper labials with the fourth through sixth in the eye, the loreal enters the eye in both, the temporals are 2 + 3 throughout, and both have two pairs of lower labials in contact behind the mental followed by two pairs of chin shields. This is the first record of the species from the territory.

Dryadophis melanolomus melanolomus (Cope), 1783, 4188. This appears to be the first valid record of the species from the territory, although Stuart (1941, p. 82) plotted a specimen record from "Colonia Santa Maria" as in Quintana Roo. The original field notes made by W. T. Broughman, who gave the collection to the University of Michigan Museum of Zoology, states that there were "nine snakes from vicinity of Colonia Santa Maria by courtesy of Prof. Mariano C. Trinchán Quintana of Escuela de Benito Juárez, Cozumel." No state is mentioned, but most authors have considered the locality to be in Yucatán, including Stuart (1935, p. 4). The validity of assigning this locality to any state is to be regarded as questionable (the specimens concerned are UMMZ 76162; 64-69). The two specimens in this collection agree well with Stuart's description of the species. Stuart says the infralabials, chin, and throat are white, and this is true of 4188, but 1783 has the chin and throat liberally spotted with grayish-blue. The limit of the dorsal ground color appears to be the sharp angle of the ventrals. Both specimens have 183 ventrals; 1783, a male, and the only one with the tail complete, has 128 subcaudals.

Elaphe triaspis triaspis (Cope), 1786-87, 1792, 3169, 3196-97. These six specimens constitute the first record of the species in the territory. They are treated in greater detail by Dowling (ms.), and will not be discussed here.

Ficimia publia publia Cope, 3188, 4184. This species has not been previously recorded from Quintana Roo. Both specimens are males, with two postoculars on both sides and the internasals present. With 3188 listed first in each case, the ventrals are 145, 137; subcaudals 37, 39; body blotches 29, 23; tail blotches 9, 8. All the dorsal blotches on both specimens are broken on the sides by a light area on the adjunct halves of the fourth and fifth scale rows, with the lower portion of the blotch occupying the adjunct halves of the third and fourth rows, and with considerable brown spotting on the sides. The venter is immaculate.

Imantodes cenchoa leucomelas Cope, 3195. This species is new to the fauna of Quintana Roo. Although the specimen is in extremely poor condition, and has been both ant-eaten and dried, the species identification is trustworthy. The vertebral row of dorsal scales is greatly enlarged, and is easily three times the width of the paravertebrals, which is not true of the other two species of the genus known from the state. The dorsal spots are large, much wider vertebrally than laterally, unbroken on the sides, and considerably wider than the interspaces, while in *tenuissimus* the bands do not narrow on the sides and are equal in width to the interspaces posteriorly, and in *splendidus* all of the posterior bands are broken laterally leaving a vertebral and two lateral spots. No scale counts can be made on the specimen.

Imantodes splendidus splendidus (Günther), 4186. This specimen constitutes the first record for the territory. It has been assigned to this subspecies despite an indication of its being intermediate between the typical subspecies and *luciodorsus* Oliver. The range of ventrals for *splendidus* is given by Smith (1942, p. 388) as 198–201, while the range for *luciodorsus* is 205–225. No. 4186, a female, has only 186 ventrals, thus establishing a new lower limit for *splendidus*. It has 37 body bands, as compared with 34–39 for *splendidus* and 43–52 for *luciodorsus*. All bands posterior to the sixteenth are broken laterally, however, a character usually ascribed to *luciodorsus*. The dorsal interspaces are darkened by pigment deposition, a condition repeated on UMMZ 80936, from Yucatán.

Imantodes tenuissimus Cope, 3178. This species is recorded from the territory by Smith and Taylor (1945, p. 77). No. 3178 is a male, with 246 ventrals, 156 subcaudals, a slightly enlarged vertebral row of scales, and dorsal bands that are not or only slightly narrowed laterally.

Lampropeltis doliata blanchardi Stuart, 1789. This is the first record of the genus for the territory. The individual fits the type description (Stuart, 1935) well, having 206 ventrals, 57 subcaudals, 18 white annuli on the body and tail, and a completely black snout. It has a single anterior temporal.

Leptodeira annulata polystica Günther, 1793, 3194. These specimens are very light, with small dorsal blotches, which extend laterally to the seventh or eighth scale rows. The lateral blotches are almost completely absent. The belly is creamy white and immaculate. There are three preoculars (a condition typical of the species, according to Taylor, 1938, p. 332) on the right side of 3194. The lowest preocular, or the subocular, is missing on the other side and on 1793, and in all three cases the third through fifth labials enter the eye. 1793 has 47 dorsal spots on the body, 199 ventrals, and 97 subcaudals. The body of 3194 is in two pieces, and its tail is incomplete.

Leptodeira yucatanensis yucatanensis (Cope), 1799, 3190. This species is apparently new to the territory, although Smith and Taylor (1945, p. 212) list it from there in their state lists. They give the range

of the species as "The northern portions of the Yucatán Peninsula," and note records for Yucatán only. I find no records in the literature to substantiate the presence of the species in Quintana Roo. Both specimens are males. 1799 has 180 ventrals, 77 subcaudals, two preoculars and a subocular on both sides. 3190 has 181 ventrals, 76 subcaudals, and a single preocular and subocular on both sides. 1799 has 24 + 13 dorsal rhombs, 3190 has 26 + 12, with all the rhombs reaching the ventrals on both specimens.

Micrurus affinis alienus (Werner), 1800, 3179-80, 4187. This subspecies has not been recorded from the territory, although *M. a. mayensis* has been. These specimens have been compared with paratypes of *mayensis* and *stantoni* (which is a synonym of *alienus*), and there is little doubt that they resemble the latter more strongly. The black rings are equal to or slightly shorter than the red rings in these specimens and in *alienus*, while in *mayensis* the red areas are twice or more the width of the black. The four specimens have 16, 19, 19, and 26 black rings on the body, and 4, 5, 5, and 6 on the tail, and therefore are intermediate between the counts of *mayensis* (10-18) and *alienus* (21-28). The ventral and subcaudal counts for two males are 194, 45 and —, 51 (this specimen is badly broken up); the same counts for two females are 215, 41 and 224, 41. It seems that *alienus* inhabits the southern portion of the territory of Quintana Roo, while *mayensis* is found in the northern portion.

Ninia sebae morleyi Schmidt and Andrews, 1795-96, 3171, 3173-76, 3182, 3193. There are two males in the series of nine specimens, 3174 with 142 ventrals and 52 subcaudals, and 3175 with 140 and 50. The ventral and subcaudal counts for the females are: 149, 40; 143, 45; 143, 43; 145, 44; 152, 44; 147, 43. The ninth specimen is badly dried and its sex is indeterminable.

Sibon nebulatus (Linnaeus), 1785. This is the first record of the presence of this species in the territory. The specimen, a female, has 183 ventrals, 87 subcaudals, a single postocular on the right side with two on the left, and nine lower labials. There are three gular scales on the left side of the chin paired with only two on the right. The head and neck are rather badly smashed.

Sibon sanniola (Cope), 3177, 3185, 3187, 3191, 3199. To date this species has not been recorded from the territory. The three males have the following ventral and subcaudal counts:—, 81; 150, 76; 155, 76. The two females have 152, 72 and 156, 66. The reasons for placing this species in the genus *Sibon* are more fully elucidated elsewhere (Peters, 1952).

Spilotes pullatus mexicanus (Laurenti), 1794. Previously known from the territory.

Tantilla moesta (Günther), 3181. This species has previously been known only from Yucatán and Guatemala. The preocular contacts the nasal, separating the prefrontals from the upper labials. The specimen, a male, has 149 ventrals and 59 subcaudals.

Thalerophis richardi praestans Cope, 1797. Although Smith and Taylor did not list this species from Quintana Roo, Oliver (1948, p. 250) recorded a specimen in the American Museum of Natural History from Xkanha. No. 1797, a female, has 181 ventrals, 171 subcaudals, eight upper labials, one primary and two secondary temporals, and ten lower labials. It is the first specimen of the subspecies to have other than a single preocular, for it has two preoculars on the left side.

Tropidodipsas sartorii sartorii Cope, 3198. This species is new to the fauna of Quintana Roo. The specimen is badly broken up, with the body in three pieces. There are 63 subcaudals, but it is uncertain whether the tail is complete or not, for there are four dorsal scale rows to the tip. Only one white band is incomplete across the belly, due to an alternation of the black bands. There are sixteen white bands on the body and six on the tail, with one of the latter also incomplete. There are six labials on the right, with only the fifth in the eye, and seven on the left, with the fourth and fifth entering the eye. One preocular and one subocular are present on both sides, with the loreal entering the eye between them.

Xenodon mexicanus Smith, 3183. This is the first record of the species from the territory. The specimen, a juvenile male, total length 210 mm., has 127 ventrals and 42 subcaudals. The second through fourth subcaudals are undivided, and the last few are extremely swollen and raised into nodules. There are eight upper labials and eleven lower labials, with the other scutellation as on the type of the species. The light bar between the eyes is present; the light bar on the temporals is broken and does not contact the interocular bar. The belly is traversed by extensions of the dorsal crossbars, which fuse on the midline. There are fifteen crossbars on the body and four on the tail.

LIZARDS

Aristelliger georgeensis (Bocourt), 4182. This species has been recorded from Cozumel Island, which belongs to Quintana Roo, but this specimen is the first record for the mainland of México. It has fourteen subdigital lamellae on the fourth toe of both hind feet. On the fifth toe on the left foot there are eleven lamellae; on the right foot the fifth toe has thirteen.

Coleonyx elegans elegans Gray, 3194, 3200, 4185. None of these specimens have the normal cross bar pattern replaced by longitudinal stripes. Klauber (1945, p. 194) mentioned this replacement as occurring in certain areas on the Yucatán Peninsula.

Thecadactylus rapicaudus (Houttuyn), 4183. There are no previous records of this species being found within the limits of the territory.

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